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ABSTRACT

The findings of an experiment designed to test and evaluate the impact of two-way cable television (CTV), located in three neighborhood communication centers in Reading, Pennsylvania, on the delivery of public services to senior citizens, indicated that CTV can effectively serve the information needs and preferences of all urban citizens as well as the original target audience. This volume includes a summary of the findings and eight papers on topics related to the project: (1) the implementation process, (2) design and implementation of the interactive CTV system, (3) technical configurations of the system, (4) interactive telecommunications and local community processes, (5) costs of the system and alternatives for replication, (6) a frame analysis of interactive television, (7) citizen participation through two-way CTV, and (8) an economic evaluation of the system's output. (CMV)

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TWO-WAY CABLE TELEVISION: AN EVALUATION OF COMMUNITY USES IN READING, PENNSYLVANIA

Final Report to the
National Science Foundation

Volume 1

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Mitchell L. Moss

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

Edited by
Mitchell L. Moss
Director of Research,
Co-Principal Investigator

APRIL 1978

The NYU-Reading Consortium
New York University
Alternate Media Center/School of the Arts
Graduate School of Public Administration

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Cover Photographs by Eileen Connell

Preface

Public uses of cable television are among the most widely discussed applications of new communications technology. However, the promise of cable television as a community service mechanism has yet to be realized. This is due both to the regulatory environment which until recently inhibited the growth of cable systems in the United States, and to the uncertainty about the costs and effects of public uses of cable television. The rapid growth of cable television systems is now being projected as a result of the changing regulatory climate and advances in telecommunication systems.

This report presents the findings from an experiment sponsored by the National Science Foundation which was designed to test and evaluate the impact of two-way cable television on the delivery of public services to senior citizens. The experiment was conducted in Reading, Pennsylvania by New York University in collaboration with local government organizations and the ATC-Berks TV Cable Co. The findings of the project are grouped into two major areas: analysis of the implementation process; and evaluation of the effects of the two-way cable television system. These findings are presented in two volumes and a summary.

The first paper in Volume I presents "A Perspective on the Implementation Process" by Red Burns. The next paper, "The Design and Implementation of the Reading Interactive Cable System" by Ben Park, describes the planning and development of the two-way cable system. The third paper, "The Technical Configuration of the Interactive System" by Gary Schober, describes the technical equipment that was used in the Reading cable experiment and how it was tested, deployed, and adapted. The role of citizens and public sector organizations in the development of the two-way cable system is discussed in the fourth paper, "Interactive Telecommunications and Local Community Processes" by Mitchell L. Moss.

The fifth paper, "Costs of the Reading Interactive Cable System and Alternatives for Replication" by Elizabeth Durbin and Judith Fields gives a detailed account of the actual cost components of setting up and operating the two-way cable system. It also analyzes the different cost components so that those interested in establishing similar systems can estimate what the costs might be.

The sixth paper, "Interactive Cable Television: A Frame Analysis" by John Carey, analyzes the communications processes and protocols which were used in the two-way cable system. The seventh paper in Volume I, "Citizen Participation Through Two-Way Cable Television" by Jody Brown and Mitchell L. Moss, examines the use of two-way cable television as a means of communication between senior citizens and local government officials. The last paper, "Economic Evaluation of the Output of the Reading Interactive System" by Judith Fields with Introduction, Summary, and Recommendations by Elizabeth Durbin, evaluates the output of the cable system from three perspectives: the average cost of interactive programming, the average cost per participant hour of specific social services, and the uptake of certain outreach programs.

Volume II of the Final Report, "Impact of a Neighborhood Communication Center System on the Elderly in Reading, Pennsylvania" by Mary Eckert, Glenn Gritzer, Louanne Kennedy, and Herbert Menzel, presents the results of a before-and-after interview survey of elderly persons conducted in Reading. A Summary is also available which deals more briefly with many of the issues treated in these separate reports and provides an overview of the entire research project. In addition, a set of composite videotapes of the two-way cable programming is available from the Alternate Media Center at the School of the Arts of New York University.

The findings of the experiment indicate that public uses of two-way cable television can serve important community purposes at relatively low cost. It is hoped that the results of this project will be used by citizens and communities in the planning and development of urban cable television systems. The findings of this study are also intended to be of value to public officials in formulating telecommunications policy, to administrators of service delivery organizations, and to researchers concerned with the use of communication technologies in urban settings.

Summary of Findings

In 1975, the National Science Foundation funded an experiment in two-way cable television to be conducted in Reading, Pennsylvania by the NYU-Reading Consortium. The consortium consisted of the Alternate Media Center, School of the Arts, and the Graduate School of Public Administration of New York University, the ATC-Berks TV Cable Co., the City of Reading, the Berks County Senior Citizens Council, and the Reading Housing Authority. Five major research questions were addressed over the course of thirty months:

1. What are the costs of establishing and operating a system of interconnected neighborhood communication centers (NCCs) to provide services to senior citizens?
2. How can senior citizens and public agencies use two-way cable television to serve their needs?
3. What are the effects of interactive cable programming on senior citizens' knowledge and use of public service?
4. What are the effects of interactive cable television on senior citizens' involvement in social and political processes?
5. How can community resources be mobilized to operate a two-way cable television system?

Reading, Pennsylvania is an industrial city of 87,643 located in Berks County, approximately 60 miles northwest of Philadelphia. It is the county seat and center of economic life for Berks County, which has a population of 296,352. The interactive cable television system was created for two complementary groups of users: the senior citizens, who constitute 16 percent of Reading's population; and the public agencies that serve them. The experimental system was comprised of three neighborhood communication centers (NCCs) which were equipped with small studio television cameras and large monitors. These neighborhood communication centers were linked together via two-way cable which allowed two-way communication among the three centers. These centers were located in a multi-service center and two senior citizens' housing projects. Converters were also installed in the private homes of 117 elderly citizens so that they could view the cable programs over their home television sets and participate by telephone.

The response of the home viewers to the interactive system was so positive that it was decided to carry the programs over a regular cable channel so that all 35,000 local cable subscribers could view the programs and participate by telephone. The offices of the mayor, city council members, and county commissioners were connected to the interactive system on a regular basis. In addition, several local high schools and nursing homes were linked to the system on a rotating basis.

During the experimental phase, a staff of local citizens with no professional experience in television production was hired by New York University to operate the interactive cable system. This staff was trained in the use of two-way video equipment and subsequently assumed responsibility for teaching the senior citizens how to use it. Black-and-white video equipment was chosen for the project because it is relatively easy to operate; this made it possible for lay citizens to produce two-way cable television which was technically adequate but not as polished as the one-way television programs carried over commercial television stations.

Although New York University was responsible for the overall management of the project, senior citizens participated in virtually all aspects of the two-way cable system from planning to actual production. Programming consisted of daily interactive sessions which originated from the NCCs as well as from various remote locations such as the city hall and the county courthouse. The programs, which were transmitted two hours a day, five days a week, were initiated and produced by senior citizens and representatives of public organizations in collaboration with the locally-hired staff.

Senior citizens used the two-way cable system to communicate among themselves and with public officials about a broad range of subjects. There were more than four hundred hours of interactive programming over a period of fourteen months. The content included weekly sessions in which senior citizens talked with the mayor, city council members, county commissioners, and representatives of social service agencies. Other programs featured yoga lessons, group singing, discussions of local history and folklore, cooking lessons, and poetry reading. Rather than having government agencies assume responsibility for the production of programs, senior citizens, acting both as consumers of public services and as the clientele of specific agencies, were responsible for coordinating public service programming.

Through their involvement in the planning and operation of the two-way cable system, senior citizens were able to articulate their preferences for specific types of cable programming directly to local government agencies. More than seventy public and quasi-public organizations used the interactive system to communicate with senior citizens. Twenty of these organizations were regular users of the two-way cable system and fifty participated on an occasional basis. At the end of the experimental phase of the project, the interactive cable system was turned over to a newly-created non-profit corporation, Berks Community Television, which assumed responsibility for the operation of the two-way cable programming.

The total cost of setting up the Reading two-way cable system, $160,000, and the present cost of cable programming, $8,000 per month, proves that community uses of cable television can be developed and maintained at relatively low cost. Although the free or low-cost labor provided by the elderly may not always be available, the Reading project clearly demonstrates that ordinary citizens can produce interactive cable programming. Moreover, the low cost of providing social service information over the system compares favorably with traditional service delivery mechanisms. Although the interactive cable programs did not produce increases in the use of social services, the two-way cable programs did improve senior citizens' knowledge of public services and their skills as consumers of public services. Further, it strengthened senior citizens' contact with each other and their involvement in community affairs.

The interactive cable system provided an organizational and technological environment in which learning could occur. Senior citizens, the local staff, and public officials developed expertise in the use of cable technology which led to increased efficiency in the operation of the cable system. Citizens and elected officials also gained skill in communicating over the course of the project. Participants became more adept at expressing their opinions and giving information as well as more assertive in stating their positions. Perhaps the ultimate test of the experiment is reflected in the willingness of the local users to commit their time, effort and financial resources to the continuing operation of the interactive system.

Although the Reading cable system was designed to provide a specific set of public services, it has more accurately functioned as a community communications system. What has clearly emerged is the development of a communications infrastructure which served a diversity of needs. For a city like Reading, without its own broadcast television station, the interactive cable system is a vital means of communication between senior citizens and government agencies. In an era when telecommunications have most frequently been used to overcome territorial boundaries and thereby transcend local values, the two-way cable system in Reading demonstrates the potential for communication technology to reinforce community consciousness and to reflect the distinct preferences and priorities of an age-based sub-group of the population. The Reading cable system has fostered a sense of community at the local level by increasing the community's dependence on its own resources, rather than imported ones.

Although the exact nature of the Reading cable system may not be generalizable to communities elsewhere, the principles underlying the experiment are clearly applicable to other settings. The principles entail:

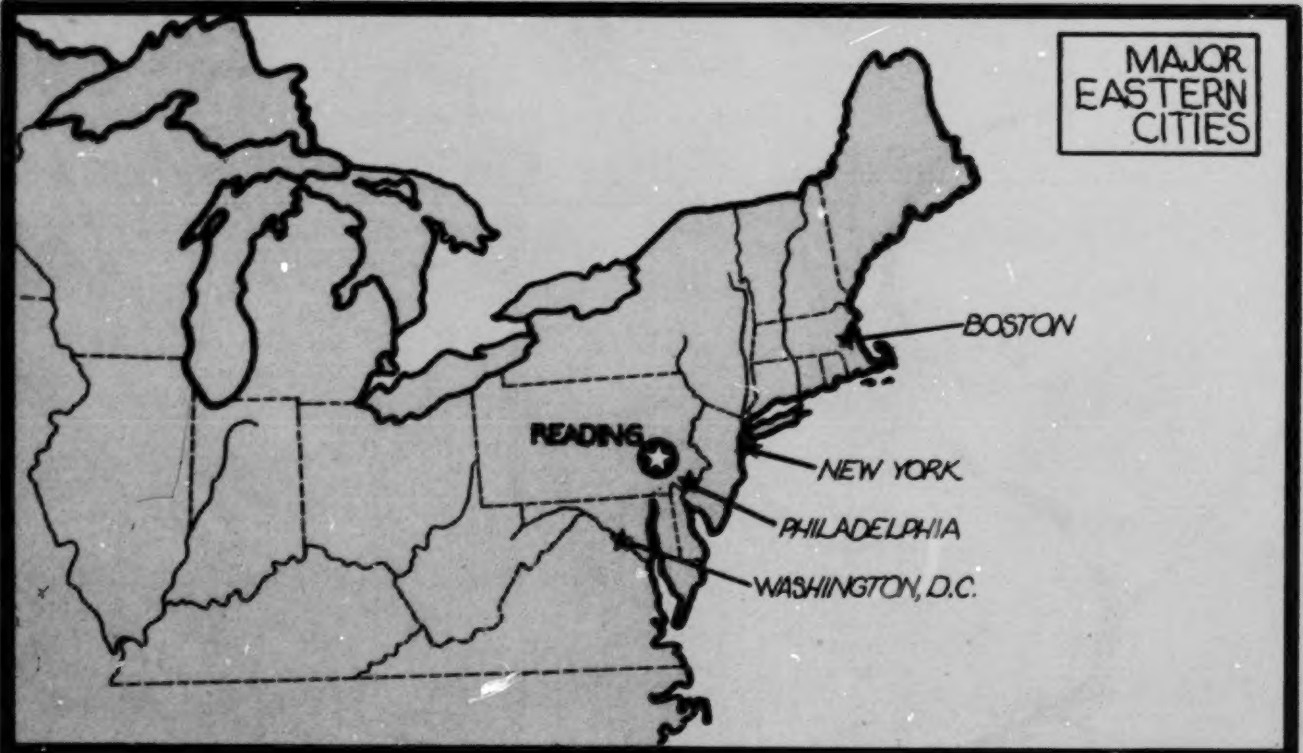
1. The role of citizens as initiators of programming.
2. The use of local neighborhood facilities as the origination sites for programming.
3. The reliance on spontaneous, interactive programs.
4. The aggregation of organizations to generate a diversity of public service programming.
5. The emphasis on programming to serve distinct sub-groups of the population.

By having citizens initiate the programming, the consumers of services rather than the producers of services have the incentives for developing public service applications. Service delivery organizations are not in the position of trying to find a use for cable technology but rather can respond to the requests of consumers for specific public service programming. By aggregating organizations to use interactive cable television, many public agencies can participate in cable programming without a major investment of resources.

The use of neighborhood-based centers builds upon existing community organization and provides a familiar and non-institutional setting for participants. Spontaneous programming enhances the flexibility of interaction and responsiveness to citizen preferences. Programs oriented towards population sub-groups allow cable television to serve specialized communities which may be defined by age, race, cultural values, or other characteristics. Such programming permits cable television to serve important social and political functions which are not available through conventional broadcast television. The particular process by which these principles are applied will, of course, vary from city to city.

The Reading project clearly demonstrates that sufficient resources exist at the local level for public service uses of cable television to be developed and sustained. For other communities to benefit from the findings of the Reading project, it is necessary that public policy for cable television continue to require that cable systems have two-way capability and cable channels be designated for public uses. Further, citizens and policy-makers must assure that both the technical configuration and organizational arrangements for urban cable systems be designed to strengthen local community communications. This requires not only that a cable system have two-way capability, but that neighborhood facilities and portable equipment be available for citizens and community groups to develop their own interactive programs. Finally, it will be necessary to create an institutional framework through which citizens and service delivery organizations can jointly develop two-way cable programs.

The experience in Reading shows that cable television can effectively serve the information needs and preferences of urban citizens. In an era when information plays an increasingly important role in public policy-making, cable technology makes it possible for individuals and groups at the local level to have their own means of electronic communication. By strengthening citizen access to and control over information, cable television enhances the ability of citizens to communicate with public officials and to participate in community processes. The findings from the Reading cable experiment highlight the need for federal, state, and local units of government to formulate and carry out policies which provide an opportunity for the potential of interactive cable television to be fully realized.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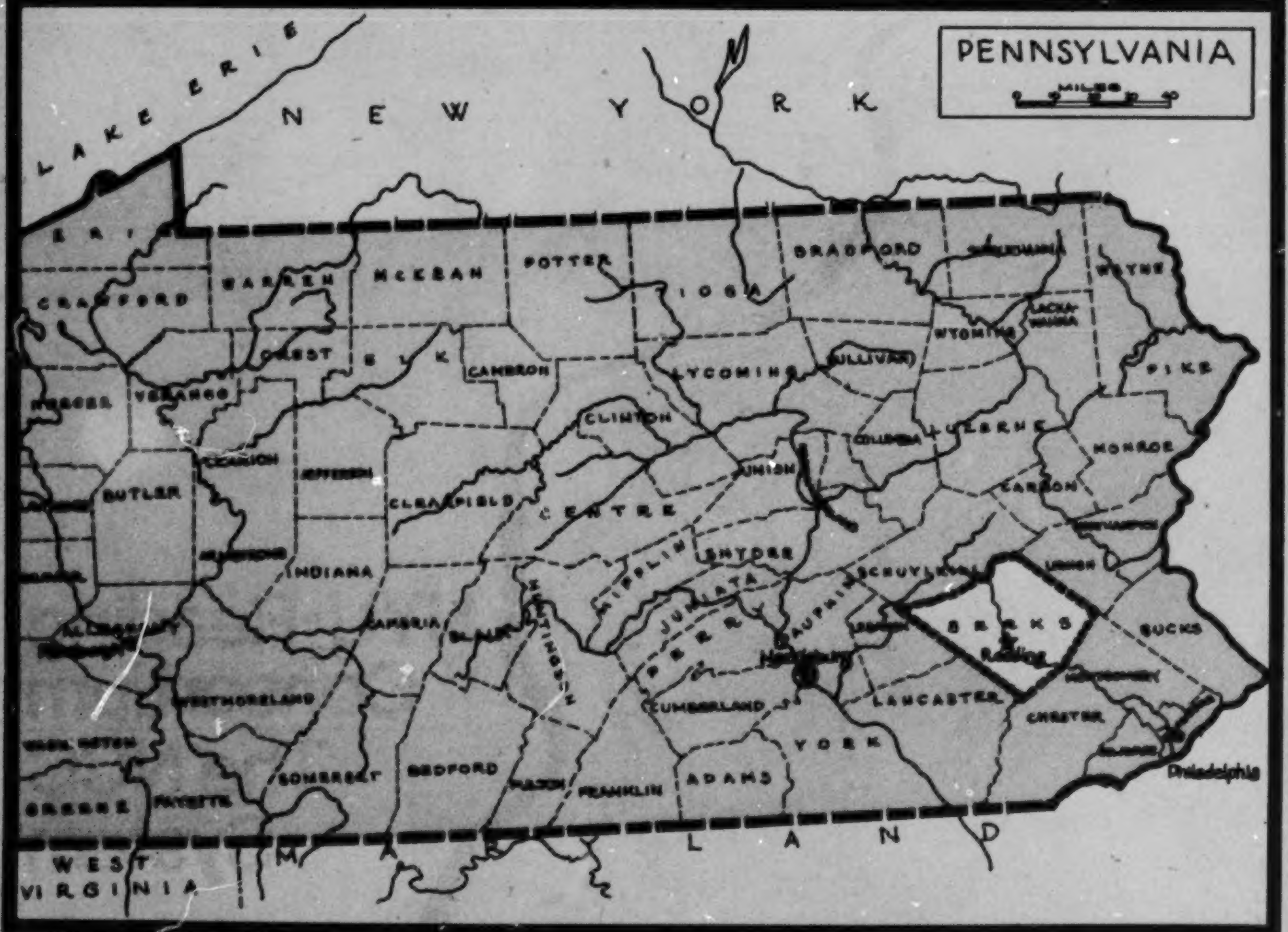
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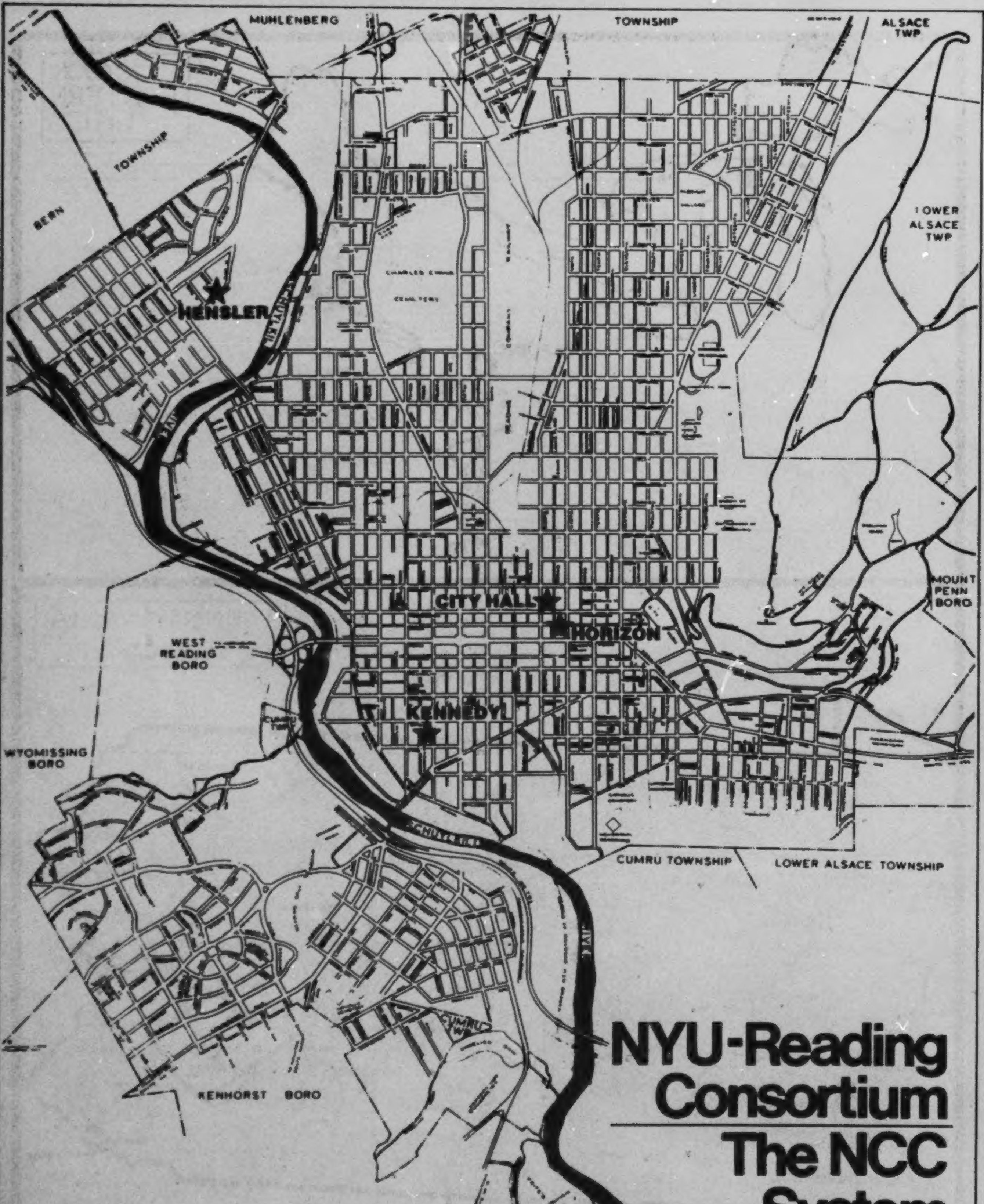
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NYU-Reading Consortium

The NCC System

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Gary Schober, Consulting Engineer, designed and adapted the technical configuration of the system in cooperation with Don Lotts, Chief Regional Engineer of the ATC-Berks TV Cable Co. Jerry Richter, Executive Director of BCTV and Pat Quarles, Production Manager of BCTV, have been dedicated to the project since its inception.

We have also been fortunate to have the advice of several experts in the field. Martin Elton has played a critical role throughout the course of the project, providing guidance to both the implementation and research teams. He reviewed earlier drafts of the final report and gave unsparingly of his time and energy. Robert Warren helped to conceptualize the research issues and has been a constant source of counsel and wisdom. Yale Braunstein, John Carey, Barbara Felton, Seymour Mandelbaum, and Percy Tannenbaum made valuable suggestions on earlier drafts of the final report.

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A PERSPECTIVE ON THE IMPLEMENTATION PROCESS

by

Red Burns

A PERSPECTIVE ON THE IMPLEMENTATION PROCESS

Broadcast television is conditioned by its own history. As the dominant mass medium in a pluralistic society, its role has been to present uniform messages to diverse audiences. There is, today, much discussion about how television can break out of this narrow role and better serve the diversity of its individual consumers. Cable television in general and two-way television in particular are among the many new technologies that have been put forward as means of addressing this perceived need.

Given the familiar image of technology as a panacea, it is not surprising that, to date, emphasis has been placed on technology itself rather than upon the social organization required to harness and direct it. We chose a technological design in Reading that was intentionally simple. Our purpose was not to implant a static, experimental system; it was to create a structure in which a community could develop and organize the use of two-way cable television to suit its own purposes.

Responsibility for developing and implementing a two-way television system for senior citizens in Reading was separated from responsibility for research design and evaluation. In implementing the concept described in the project proposal, we had to maintain a balance between constraints imposed by the research design and the realities of the local community. The local community was, itself, not a single entity. It was composed of groups and individuals with very different needs and aspirations. Maintaining a balance between these varying and at times competing demands required constant attention throughout the project.

From the outset, we worked with future as well as immediate goals in mind. If, as we anticipated, the system developed into a valuable and accessible community resource, there was every reason to believe it might continue after the NSF-funded experiment had ended. And unless this possibility was taken seriously from the outset, we did not feel justified in asking the community for the enormous contribution of energy which would inevitably be necessary to make the experiment a success. Our responsibility to the citizens of Reading necessarily transcended our research goals. Our responsibility to the National Science Foundation meant that the research goals could not be sacrificed to local interests.

During the initial eight month phase of the project, we hired and trained local staff and implemented the physical and technological components of the system. Though the cable in Reading had some two-way capability, we had to add the planned neighborhood communication centers for origination and reception of video and audio signals. The designated physical environments were adapted to provide suitable spaces for interactive television. While the technical requirements of cameras, lighting, and sound imposed certain constraints, there was continual examination of the trade-offs between the acceptability of the technical environment and the acceptability of the social environment. Also, since we were using shared spaces, we had to be sensitive to the proprietary interests of the institutions and individuals who were occupying those spaces before we arrived.

In staff selection we focused upon warmth, openness, and interest in older people. Technical experience was considered useful but not indispensable. Staff were recruited in two phases. Each neighborhood communication center required a full-time coordinator and part-time technical assistants. Coordinators were recruited first and they were trained to train the technical assistants. This activity was directed towards a crucial subsequent responsibility: the training and orientation of individual users.

The training activities were rounded off with simulation exercises. Facilities in Reading which already had two-way transmission capability were used before the NCCs themselves were ready. In these exercises, which took place daily for a month, we joined with the locally recruited staff in exploring the properties and problems of the system we had set up.

In our early contacts we were constantly aware of the importance of a user's initial impressions in establishing a philosophy of what the system could provide. Regular broadcast television had implanted preconceived notions that were hard to overcome: people were used to watching, not to participating. No alternative metaphors were available, so it took a long time to develop an orientation towards using the medium, rather than being used by it.

During the initial eight month period, we also made presentations to groups of senior citizens to encourage their involvement in the system. The second phase lasted fourteen months and started when the interactive cable system became operational. During this period, the structures for "programming" and for the community management of the system were developed; many different activities were taking place at the same time. Here again balances needed to be struck between competing objectives. We were accountable to the National Science Foundation and had to retain ultimate responsibility for decisions. But we also considered it necessary to prepare the way for eventual local governance. We asked the previous mayor, a senior citizen himself, to help in creating a local board which would initially serve a planning function. We believed that this would both serve as the basis for later management of the system and help us considerably during our term in Reading.

The development of programming proceeded in parallel with the setting up of the local board. As stated in the proposal, the system was to be used by "complementary sets of clients"--the elderly and service providers--for the "delivery of public services." We saw this as positing both a need and an opportunity to enable the elderly to be on a more equal footing with the providers of public services, and we felt that the key to this lay in the new relationships that would arise from increased and new types of interaction between provider and client.

If interaction was the key then it was important to work with the clients first before working with the agency staffs. We proceeded in that order. In the development of programming, we went to considerable lengths to create a new and different notion of television. If the system were to reflect its users and their needs, then the environment and the technology had to encourage socializing. If people would continue to behave as themselves while using the system, it would increase the effectiveness of the system. Initially, everyone wanted to "make television." Exploring, exchanging, talking back-and-forth, and learning were not part of their image of television. Those using the system, however, were neither considered, or encouraged to be "performers." Even though it contradicted their ingrained understanding of the nature and function of television, they were encouraged to be themselves.

We started the second phase of the project with five hours of programming a week. Each day consisted of small programming units, with each center taking responsibility for creating and hosting a share of the programs. It was soon extended to ten hours a week. Everyone was invited to participate with suggestions and ideas for programming units and to actually put the program together. These groups fed ideas to the monthly meeting of a programming committee made up of a representative of each center's own unit, project staff members and, eventually, a member of the local board. Scheduling and production plans were finalized by this overall committee.

Throughout the implementation process we were keenly aware of the need for continuous growth in user involvement. It took a long time for enough people to become involved to provide the basic support necessary to sustain the system. We deliberately chose to build slowly and encourage participants to gain skill and expertise in the use of the system; and this led to increased understanding and user-involvement.

We saw the most important part of implementation as being the design and development of a process - a process through which individuals and groups in the community would genuinely participate in building and experimenting with a two-way cable system and later take it over completely. We saw the system as one which would have to accommodate widely differing people and widely differing interests. The system, which has been renamed Berks Community Television, has become an accepted institution in the city of Reading. The fact that BCTV has become an integral part of the community suggests that the commitment to community involvement in the implementation process was worth the effort.

DESIGN AND IMPLEMENTATION OF THE READING INTERACTIVE CABLE TELEVISION SYSTEM

by

Ben Park

DESIGN AND IMPLEMENTATION OF THE READING INTERACTIVE CABLE TELEVISION SYSTEM

Introduction

This report contains a description of the process by which Reading's interactive television system proceeded from design[1] through implementation during the experimental phase of the project conducted by the NYU-Reading Consortium. The process was, and remains, evolutionary. The interactive television system organized by the consortium continues to operate under its own auspices.

Chapter One discusses the technical and physical aspects of the system and the staffing required to operate it. Central to these arrangements was the concept that interpersonal interaction could be facilitated by using two-way television; thus, the chapter attempts to illuminate the systematic connections between technology and people. The chapter's main emphasis is on the people who used the system and those who assisted them.

Chapter Two is based on the thesis that the television medium inherently organizes information both in time and space. Thus, in establishing its day-to-day working methods, the organizing tendencies of television had to be considered and adapted to the requirements of multipoint interaction. A sampling of interactive formats is described: "Singalong" (total participation); social service and citizen-government interactions (discussion formats); "Sense and Nonsense" (interactive quiz); Tri-Channel Poll (interactive poll); and "Is There a Generation Gap?" (open meeting). In addition, seven formats for spot announcements are described.

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[1] The reader may wish to refer to the design and implementation as proposed in 1975. See Experiment in Urban Telecommunications, Phase II, Solicitation 74-8.

Chapter Three is based on recommendations for correction and change in the system. Following systematic observation of interactions as well as interviews and discussions with staff and participants, the author summarized suggestions and recommendations which he then conveyed to the appropriate staff persons. The chapter contains a small sample of the recommendations which were made under the categories of technical adjustments, physical arrangements, protocols and conventions, and standardization of methods.

Chapter Four deals with the emergence of an additional status for Reading's interactive television system: a regular series of programs available to all cable television subscribers. Berks Community Television (BCTV) came to be regular television fare in Reading in the fall of 1976. The chapter stresses that *if* it is to be successful, the transmission of interpersonal communication as one-way programming ought never to lose sight of the fact that it depends on interaction among people. The interactions are principally among participants at the neighborhood communication centers who are both seen and heard; but home viewers can telephone and join in at any time, as well.

No sketch such as these chapters comprise can hope to do justice to the scope, depth, and infinite detail of what has evolved in the Reading interactive system. Nor can they relate satisfactorily the role that intangible factors have played in the establishment and growth of the system. For example, the major contribution of the project's local staff, at all levels, may well be the spirit of cooperation and trust it has developed among the large and growing circle of Reading's people who are involved with the interactive system. From elderly participants to government officials, business leaders, social agency personnel, and countless others, the BCTV system is regarded as a dependable and contributing community institution.[2]

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[2] A glossary of the specific terms used throughout this section is provided in Appendix A.

CHAPTER 1

The Evolution of the Design

Where? The Selection of Reading, Pa.

From its inception, the design was an exercise in pragmatics, a selection and elimination of real-world choices, the basis for a system which individuals and organizations could use to serve their interests. Hence, the approach to ATC[3] to propose involving its CATV system in Reading, Pennsylvania. ATC's Berks Cable TV Co. had been using a straightforward two-way cable system to provide interaction among schools and other institutions for several years. The Reading cable did not incorporate advanced engineering concepts[4] but it had been proven capable of two-way transmission. Reading provided another advantage. In 1971, the Alternate Media Center had established a community-access video workshop in Reading and subsequent activities drew the AMC into productive contact with local officials. The Alternate Media Center's recommendation that a joint consortium be organized received positive response from both the cable company and city hall.

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[3] American Television and Communications Corporation, with headquarters in Denver, Colorado.

[4] Reading rebuilt its cable service some years ago, but left the old cable intact. The "old" cable is now used for upstream signals and the "new" one for downstream. Both have the regular 12-channel capacity that matches standard television sets' VHF dials, plus two mid-band channels. (Newer two-way designs put both upstream and downstream signals inside a single strand of cable.)

Who? The Communication-Need Principle

Social services are delivered by people whose job it is to deliver them. They are usually received, however, on a purely voluntary basis. Therefore, attention was turned to the recipients. Which group of service recipients had greater needs for communications and what were the best ways in which those needs might be met? The elderly are a distinct group with substantial communication needs. Older people have problems in areas of health and mobility, finances, housing, nutrition, and isolation. In addition, they comprise almost 16% of Reading's population and the city of Reading has a record of being responsive to the needs of older people. Excellent public housing has been built for senior citizens and a multi-service center for senior citizens, Horizon Center, was soon to be completed. This meant that there were several locations from which the elderly could participate in an interactive system.

Who? The Elderly and Social Service Agencies

It was decided to propose a single application which would be based on the communication needs of Reading's senior citizens, as well as on the efforts of social agencies to serve them and the desirability of facilitating interaction with local government officials.

A system that could meet these needs and goals might bring senior citizens to it on the basis of their own wishes, not on the dubious premise that they would participate simply because social and government agencies wanted them to. The system ought to represent a living space which could include, but not be dominated by, the institutional concerns of government bureaus and welfare agencies. It would also provide a full measure of entertainment and an opportunity for older people to socialize, as well as to ask and get answers to their questions and allow them to air their complaints and opinions.

A full partnership for an organization composed of the elderly themselves was considered vital to the success of the system. How better to assure that the system answered the needs of its users than to put the users in a position where they could participate in its control? The Berks County Senior Citizens Council, a non-sectarian group whose membership and board of directors included not only a large number of elderly people but also representatives of the local voluntary organizations interested in serving the elderly, was invited to join the consortium.

How? The Neighborhood Communication Center Concept

Television state-of-the-art in 1974 required one full television channel for each live television picture, and a television channel was a limited resource. The kind of television interaction to be facilitated required a live television picture and audio from each participating location.[5] (The plan that was devised used three channels upstream and one downstream channel on a regular basis during the Monday through Friday periods that interaction took place and, almost always, one additional upstream channel, sometimes more.) Since participation via two-way television from multiple locations such as homes was not feasible, it was important that interactive television be established in locations where numbers of elderly people would have ready access to it; hence, the concept of neighborhood communication centers (NCCs).

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[5] Audio requires far less channel "space." An audio channel uses only a few thousand hertz (cycles per second) of frequency. Live video uses at least four-and-a-half million hertz.

From the standpoint of implementation alone, aside from other constraints which were imposed by the requirements of the research design, neighborhood communication centers had to be easily accessible to elderly people within the Reading city limits (an NSF criterion), distant enough from each other to achieve some geographic dispersal, and near enough to a branch of the Berks TV cable so that difficult wiring would not be required. In addition, the locations had to have common spaces large enough to accomodate fifty people with ease. The spaces had to be adaptable to the requirements of interactive television and had to be available to the project on a relatively permanent basis.

The Neighborhood Communication Centers

It was decided quite early that one NCC should be in the Berks County Senior Citizens Council's multi-purpose Horizon Center, serving people from all neighborhoods, and that the other centers should be located in public housing for senior citizens. This would assure a high concentration of both elderly people and low-income elderly who were unlikely to spend money for transportation. Before deciding which public-housing units should be involved, the consortium asked the Reading Housing Authority to join it and make space available for neighborhood communication centers. The map of Reading (which appears earlier in this volume) shows the locations that were selected for the three neighborhood communication centers.

Horizon Center. The first NCC was in Horizon Center, the Berks County Senior Citizens Council's three-floor, multi-purpose building which was completed in October 1975. The basement floor housed a cafeteria, a billiards and card room, and a small office which became both storage room and staff quarters for the NCC staff; this office came increasingly to be used for production meetings between the staff and senior producers and presenters. The main floor of Horizon Center had a lobby and coat room off a very large hall which was divided in two. One of these halves became the Horizon NCC; most of the television equipment had to be moved down to the office after each morning's interactive session. The second floor of Horizon Center housed staff offices, a reading room, craft shops, and meeting rooms.

Kennedy Towers. The second NCC was in Kennedy Towers, a high-rise with apartments for senior citizens operated by the Reading Housing Authority. The main floor housed a laundry room, staff offices, and a kitchen off a large community room which doubled every day as a luncheon group meal site.

A large room in the basement had been designated as the site of the NCC. This room would have accommodated the TV equipment so that it need not be moved. Later events[6] overtook this scheme and forced a move to the first-floor community room.

Hensler Homes. The third NCC was in Hensler Homes garden apartments for senior citizens in a complex operated by the Reading Housing Authority. A separate community building in the center of the complex comprised two large rooms separated by a flexible divider, as well as an office and a kitchen. One of the large rooms was dedicated to the NCC and equipment was left in place after the interactive sessions. Staff and seniors could use the space for meetings and production work at other times.

Why Three Centers?

Previous interactive television projects (over thirty in number and principally in health-care service delivery), were two-point systems where participants in each of the two locations saw and heard each other throughout their interactive TV sessions. From the viewpoint of learning about communication problems and opportunities, a two-point system would have provided nothing new. It would not have necessitated the development of methods and protocols for sharing the interactive video space among groups and individuals sometimes seen, sometimes unseen.[7] In addition, service to people identified by their communities of interest, in any city using interactive cable TV, would find that more than two settings were desirable; thus, a model for multiple interactive links was indicated. The smallest number of locations requiring multiple links is three. The formula $L = \frac{n(n-1)}{2}$ expresses this, where L is the number of links and n the number of locations. Two locations require only one link, but three locations need three. Thus, three was the least expensive model for multiple links. The same thing might have been accomplished with two permanent locations, provided a third temporary or rotating location was always included in the system. As it was, by fall 1976, such a rotating location (Social Security Office, City Hall, County Building, a local high school) was a regular feature four days a week; on those days, for part of the session, the system regularly comprised four locations (and six links).

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[6] The room would have required separate heating and air-conditioning, the costs of which were prohibitive.

The permanent locations were in senior citizen territory. Seniors also would be the first people in Reading to become familiar with the equipment. They would be the first group to use the equipment and to produce materials for sessions. They were to be on the scene when others were first being introduced to the system. The seniors would be in the position of deciding what they wanted and inviting participation by the various agencies and government officials rather than accepting a passive role and waiting to see what was offered to them. The language that went into the consortium's proposal referred to the prospective system as one which would serve a complementary set of clients; the elderly on the one hand, and on the other hand, service agency and local government officials as providers of service to the elderly. The system would serve both sets of users but the method chosen for development was to begin with the elderly.

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[7] The New York Metropolitan Regional Council's giant MRC-TV system, with thirteen locations in New York, New Jersey, and Connecticut communities, was a notable exception. However, for reasons difficult to discuss briefly, MRC-TV tended to be used more for long didactic presentations than for interactions among participants.

How? The Physical Plant: The Neighborhood Communication Centers

It was necessary to look first at the NCCs and the way they would be equipped, and then at the technical cable configuration that would integrate the NCCs into a system. The aim in designing places for interaction by television was to enable people to see, hear, and speak with ease; to present themselves as they wanted, and to understand at all times the relationship to themselves of the people in other locations with whom they were communicating. What was needed was an environment which fulfilled, as completely as possible, the expectations about communicating that people brought to it.

This was both a tall order and a complicated situation; complicated because, among other things, the presence of television screens and cameras introduced referents--or metaphors--having to do with television broadcasting and home entertainment. These conjured up behaviors and uses of language different from what one used in face-to-face settings. In other words, there was the danger of breeding hybrids both in the setting and in what would take place within the setting. It was a tall order because television pictures and sound, no matter how well organized and used, could not duplicate face-to-face settings, and people's communication expectations were differently met in the new interactive TV environment.[8]

However, in an important respect, people coming into the interactive television environment are confronted with a communication condition which they know is distinct from face-to-face environments. Eye-contact is a qualifying condition of face-to-face interaction, where it is always possible and taken for granted. When television cameras take the place of eyes, the appearance of eye-contact is possible only if particular arrangements are made. In interactive television, the cameras and monitors by which participants see and are seen are put together as close as possible to minimize parallax. Each "camera-monitor unit" becomes surrogate for the eyes of participants at its location; the camera provides their "seeing" aspect and the monitor their "seen." Thus, interactive television, by fulfilling a fundamental condition of face-to-face interaction, implies that participants occupy a mutual space. The evidence presented by the camera-monitor unit, though illusory, is compelling by virtue of its enabling the semblance of eye-contact.

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[8] For a detailed description of communication processes within the system, see "Interactive Television: A Frame Analysis" in this volume.

The centerpiece of each NCC was a camera-monitor unit, the sine qua non of interactive television. So, in spite of great divergences in the audio characteristics of face-to-face and interactive television, in spite of the fact that television pictures deny full views of distal environments, that the world of natural color was seen in black-and-white, and many other differences from what they were used to in face-to-face settings, participants were presented with compelling evidence that they shared some sort of mutual space with each other. It was assumed that camera-monitor units in all NCCs ought to be alike. This was because the units represented, in the pictures they sent and presented as well as in the way they looked, the common aspect of all NCCs. They needed to be held constant so that what varied (people, behaviors, settings) could be seen by all as uniformly varied.

Each NCC had to have microphones, but not before considerable debate was it resolved as to how many, of what kind, and, most important, how they would be best used to serve the communications in the system. Also, each NCC would require a video-switching device so that it could change from sending its interactive picture to showing a videotape or to showing a live picture from a second camera. As for lighting, although it was to be of the same general intensity and character at all centers, (because cameras and lenses were the same, and because it was desirable, when switching between and among centers, to present pictures of similar intensity and degree of contrast) had to be tailored to each location, which involved the following:

1. The NCCs could not assail participants with light so bright or beamed at such a low angle as to glare in their eyes.
2. Ceiling height and color made a difference. If light were to be bounced off the ceiling, then the lower the ceiling and the whiter its color, the less light would be required to produce a desired average of 35 foot candles at the level where people were sitting.
3. If ceilings were dark (and could not be repainted) and low, then light could not be bounced off them but had to be directed at the participants. (Lights for bouncing and for direct illumination are not only pointed differently; they are different types of lights. The former is usually a spot and the latter a scoop.)
4. It was preferable that lights be hung from the ceiling (and be either directed back onto it or at participants) or placed in existing fixtures in order to avoid running wires across the floor and cluttering the room with floor stands.

Parallel to the technical requirements of the NCCs was the manner in which the cable would convey the outputs of NCC cameras and microphones to enable people to see and hear each other.

How? The Physical Plant: Cable Configuration

The design for the system concentrated on enabling people at the three NCCs to talk and listen as well as to see and be seen. In addition, a number of home viewers were to be able to see and hear the interactions among the three centers on a mid-band cable channel available to them through a special converter attached to their television sets. The three senior citizens' neighborhood communication centers were assigned separate broadband channels on the "old" cable; the "old" cable, though no longer carrying television programs to cable subscribers, had been maintained in operating condition and was often used to enable two-way conferences among school teachers, high school classes, city officials, and hospitals. Each NCC's picture and sound travelled on its assigned channel to the cable company's head end. A small amount of cable was added to the "old" cable to accommodate the requirements of the NCC system.[9]

The head end is the nerve center of cable television. Here, all incoming channels are received (demodulated) and then sent out over the cable (modulated). The head end of ATC's Berks Cable TV Co. takes signals from television stations off the air and modulates them onto its "downstream" subscriber cable channels. The word "downstream" simply denotes that the channels are moving programs from the head end. The system had a switcher at the head end who monitored the pictures and audio coming in from NCCs on the upstream channels and then switched the appropriate picture(s) onto the midband Channel G modulator on the downstream cable.

The relationship among numbered channels in the old and new cables to Channel G in the new cable are shown in Figure 1. Each of the NCCs sent its video and audio signals to the head end, where they were modulated to Channel G, which returned one selected

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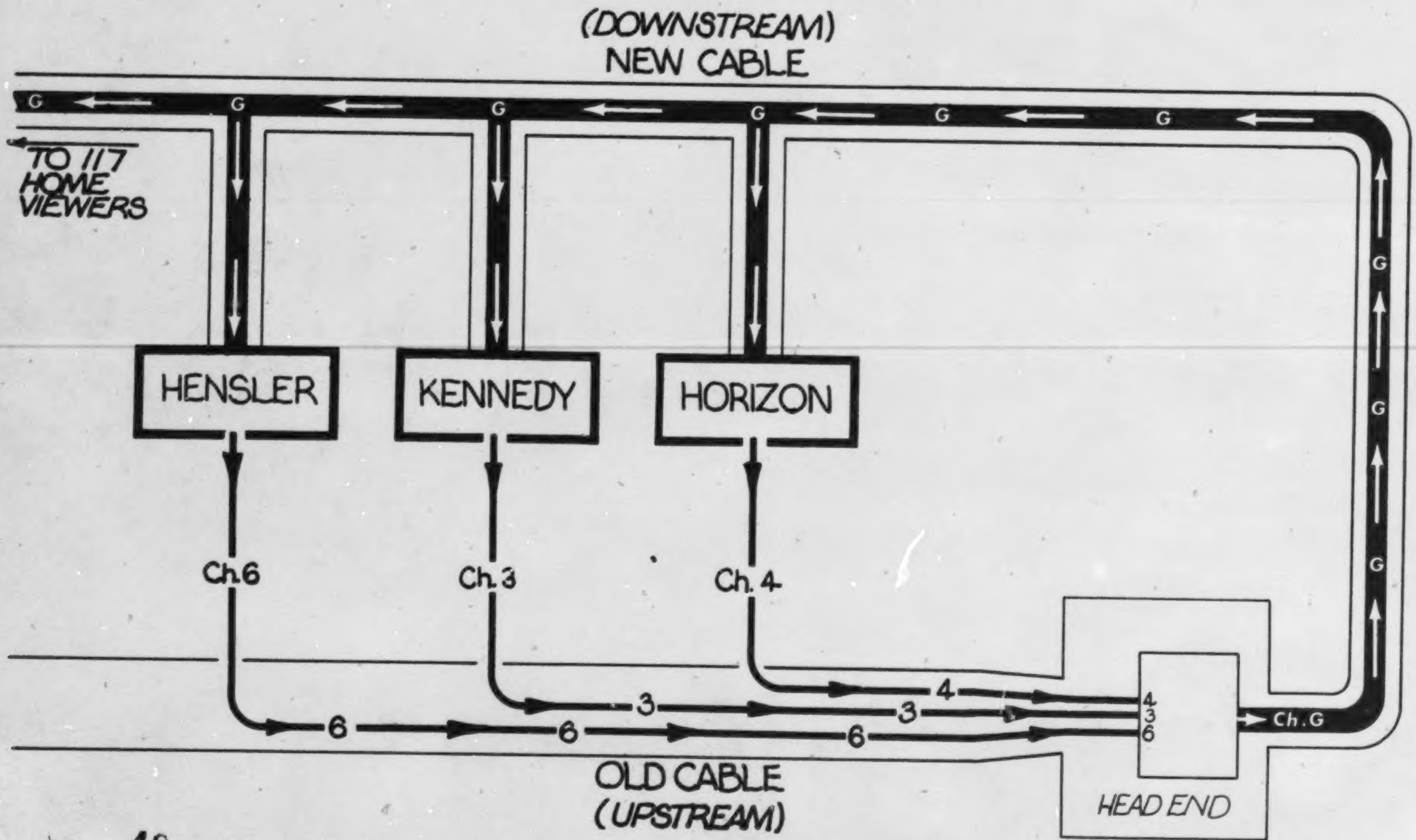
[9] See: Experiment in Urban Telecommunications, Phase II, Solicitation 74-8. The NYU-Reading Consortium, 1975, p. 9.

FIGURE 1
CONFIGURATION OF THE NCC SYSTEM


(DOWNSTREAM)
NEW CABLE
G
TO 117 HOME VIEWERS
HENSLER
KENNEDY
HORIZON
Ch.6
Ch.3
Ch.4
4
3
6
Ch.G
OLD CABLE
(UPSTREAM)
HEAD END

picture (which might be a split-screen of two pictures) common to all three NCCs and continued on to the home viewers with Channel G converters.

At one point, the notion had been briefly entertained that all three centers would see and hear each other all the time, as was the case when a system comprised two centers. As noted earlier, two centers require only one bi-directional link. Three centers require three such links. In order for people at all three centers to see and hear each other all the time, it would have meant that, in addition to its own separate upstream channel to the head end, each center would have had its own downstream channel from the head end which went to the other centers. This arrangement would have obviated any need for switching pictures at the head end, but it would have meant that each center had a separate monitor on which to see and hear the other centers; in other words, two monitors for the two other centers, a third monitor on which to see the picture from one's own center, a fourth monitor for City Hall, or the Social Security Office, and additional monitors for any additional locations brought into the interactions.

What would this have done to the maintenance of eye-contact? Where would one look? The all-see-all model was rejected before these questions had to be answered. There simply were not enough channels available for it in the cable.

How Was the Technology to Support Interaction Via the System?

Once the NCCs were equipped,[10] the cable configuration set to collect and redirect audio and video to and from the centers, and once the switcher at the head end was set to select certain signals and switch them back to the centers--what then? What determined which signals to select? What were the relationships between hardware and people?

We were confronted with two general problems. First, the NCCs were to accommodate groups of people. It was estimated that, on any one day, there might be from ten to fifty in attendance at each NCC. Second, if three locations required three bi-directional links in order to interact, how could this be provided by a system which had three channels in the upstream direction but only one in the downstream direction? Worse, how could the system provide six bi-directional links when a fourth location was added, and ten links with five locations?

The issues involved in these two problems were:

1. Making sure that individuals could see the camera-monitor unit (and thus be seen by it);
2. Making sure that individuals could hear and be heard;
3. Insuring that people could have a fair share of time, that rational discussions would stay on track, and that there would be rational turn-taking;
4. Determining the criteria for selecting the pictures and sounds that would be transmitted on the downstream channel;

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[10] For details, see: "The Technical Configuration of the Interactive System" in this volume.

5. Arranging the system to provide more bi-directional links than it had channels for.

1. Making sure that individuals could see and be seen. Once the number of people in an NCC was above thirty, those farthest from the monitor might begin to experience difficulty seeing the 21-inch screen. In order to help alleviate this situation, substitution of 27-inch screens would have been a slight improvement. Any major improvement would have required a major increase in size; projector-type screens could have provided larger images but in order for these to be seen, the surrounding light levels would have had to be lower than the 35 foot-candles calculated as minimal for the cameras by the consulting engineer. The estimates of group sizes at the NCCs were actually a bit high, and there were relatively few times that an NCC was attended by more than thirty people. Large wall-screen television picture devices had been "just around the corner" for years[11] (they may turn it in time for the new decade, and in time to accommodate larger numbers of people in neighborhood communication centers).

As for being seen, there would be no problem. Using a 10:1 (14-140 mm) zoom lens fully extended, people who were 28 feet from the lens could be seen in a close-up from top of the head to just below the shoulder line. The camera-monitor units needed to be just above the heads of seated people in order for them to see the monitor and be seen by the camera.[12]

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[11] RCA, for one, announced serious work on developing a flat TV wall-screen in the mid-1950's. The probable size of such a device would be on the order of 4 by 3 feet--and larger.

2. Making sure that individuals could hear and be heard. Hearing was not thought to be as serious a difficulty as being heard--for people who had reasonably good hearing to begin with. The television monitors contained loudspeakers and additional loudspeakers were later provided where needed. There was discussion of providing head sets for people who were hard of hearing, but this was not done, although it would not have been overly difficult to implement. Later on, it was noted that people with hearing difficulties tended to do any of three things: they sat near a loudspeaker, paid close attention to the mouths of people seen speaking on the monitor (lip-reading was facilitated by the close-up, face-on pictures of people that characterize interactive television), and--sometimes--asked a neighbor what had been said.

The matter of making sure that people could be heard was something else again. Each NCC would have between three and six microphones[13] which could be on floor stands or table stands, or could be hand-held. There was no point in opting for a particular method of mike placement, and every reason to keep it flexible, because people had the right to be able to behave as naturally as possible within the constricting circumstance of having to speak into a mike.[14] There was a period, however, when there was serious discussion of the possibility of using only one mike in order to have better control of the audio. There were several difficult factors involved:

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[12] What if someone's face was blocked or partly-blocked by a tall person directly in front of her/him? It was later observed that most people were aware of such a problem when they were "on camera" and moved into the clear. In addition, the offending blocker also moved. This meant, of course, that they were seeing themselves on the monitor screens.

[13] It turned out to be four, if the NCC was not feeding recorded sound (such as from videotape or audiotape) into the system. Such a source occupied one of the four audio inputs. Each microphone was on a separate mixer so its level could be controlled.

-The howl-around of audio feedback was a serious potential problem. This type of feedback is caused when the sound coming from a loudspeaker is picked up by a microphone and retransmitted. The slight delay between the original sound and its echo puts the two "out of phase" with each other. The result is the all-too-familiar shriek of feedback which obliterates all else. Each microphone is a potential source of feedback. Therefore, the fewer the mikes, the less chance of feedback.

-Multiple microphones in the NCCs would allow more than one person at each center to be speaking at the same time--bad enough that one person from each center might be speaking at the same time! The difficulty would only be multiplied by the number of microphones available.

-Short of the chaos envisioned above, additional microphones could pick up extraneous voices and overhear distracting side conversations.

-In order to deal with the troubles envisioned above, there would have to be an audio operator "riding gain" (opening and closing microphones, adjusting sound levels up or down) at all times. The use of one microphone per center would eliminate the need for such a person, because all audio could be controlled by the "switcher" at the cable system's head end.

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[14] Lavalier microphones--the small ones worn on a cord around the neck, or clipped to collar, blouse, or tie--were to be made available for use by "presenters," so they could have their hands free and be able to move about. Lavaliers also could be used by people who were unable to hold a mike.

In spite of the problems they might cause, it was decided to have multiple microphones at each NCC. What settled the issue was the spectre of sharing one microphone among an estimated ten to fifty participants. Neither passing the mike around nor having participants march down front to a single mike stand nor assigning someone to run around pointing a mike on a pole at people accorded with the major aim that NCC participants be able to behave with relative ease, in comfort.

Settling the question of single vs. multiple microphones in the centers was a first step. The issues raised by this decision still were not resolved:

- minimizing audio feedback;
- people talking all at once, extraneous sounds being picked up; alternately, the necessity of "riding gain" on the microphones.

It became apparent that these sub-issues, particularly the latter group, were directly related to the following primary issue:

3. Insuring that people could have a fair share of time, that discussions would stay on track, and that there would be rational turn-taking. This was the decision arrived at: to assign hosts for each interactive session and center hosts for each day, and to leave all the microphones in all the centers open all the time. Multiple open microphones on the system did indeed create a feedback problem that lasted for weeks; but a solution was found by the engineering consultant and implemented by the staff. People

did not all talk at once; on the contrary, they simply behaved with consideration and grace, but also with firmness, and interactions on the system were never chaotic.

Microphones did, on occasion, pick up extraneous sounds, but they were not allowed to become distractions; they were either politely suppressed or used as interesting inputs or commentaries on the proceedings. No one had to ride gain constantly on the audio; given the consistent behaviors that were developed by the participants, the audio levels were set each day for each microphone and--for the most part--left where they were set. In case of major audio difficulties arising in one or another NCC, the operating staff either resolved it among themselves on their private line or the difficulty was brought out in the open and resolved in everyone's hearing. The matter of the multiple open microphones is discussed for its contribution to programming in Chapter 3, and analyzed as a communications phenomenon in "Interactive Television: A Frame Analysis" which is included in this volume.

Interaction implied being able to speak when one wanted to. Any artificial restraint on that simple notion represented a fundamental contradiction to human communication. The decision to opt for multiple microphones that remained "open" all the time turned out to be the basis for the most beneficial communication behaviors developed by the senior participants.

Nevertheless, the decision to leave all the microphones open all the time and to assign session and center hosts on a daily basis[15] was not arrived at until a number of senior citizens had been regularly involved in the process. Other factors contributed to the decisions to leave all the microphones open and to not impose procedural controls other than those implicit in the role of host. One factor was the attitude of the project's small staff of paid employees as they began to come into contact with seniors at the centers in the fall of 1975: to encourage the seniors' participation and to assume that they would move into roles of responsibility and influence in the system, because the system was the seniors' to use as they wanted to.

Most early notions in the planning stage about insuring fair shares of time in orderly discussions leaned heavily toward a controlling hierarchy employing some sort of signal system (such as indicators that lit up when a center had something to say). The difficulty in all such ideas that were somehow to insure both orderly control and participation was that they prescribed behavior in an environment largely unknown to the planners and certainly unknown to the participants. Whether or not formal protocols for speaking and turn-taking combined with some sort of signalling device would have proved both comfortable and effective in Reading is not known, because they were not introduced. Issue 3, (Insuring that people could have a fair share of time, that discussions would stay on track, and that there would be rational turn-taking) should now be rephrased in recognition of the sub-issues involved in it: How did it come about that the seniors behaved and expressed themselves in ways that implied open microphones as the basis for the communication environment that evolved in the system?

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[15] The assignments were daily but the faces were always familiar. Soon after the system was operational, in the fall of 1975, it was evident that an active group of elderly people--previously unknown to each other--was being developed both as a result of encouragement by the staff and in pursuit of their own interests. This group became a cadre which provided session and center hosts and also presenters and producers. This cadre of active regulars remained fairly constant at about forty people, with a small but steady inflow of some new members and outflow of others.

The answer to this question will involve the resolution of the two remaining issues:

4. determining the criteria for selecting the pictures and sounds that would be transmitted on the downstream channel

5. arranging the system to provide more bi-directional links than it had room for.

Here are what seem to be the likely answers:

3. Seniors came individually to the centers, worked alongside the project staff, and realized -- as did the staff -- the need for leadership and orderly turn-taking. They adapted local usage to answer these needs. In order to apply this usage they needed to hear each other at all times (thus open microphones) and, preferably, see each other when they were talking together.

4. The perceptions of both seniors and staff were greatly enhanced by the introduction of split-screens which implied that, at any one time, interactions were dyadic. Rather than having three (or more) bi-directional links open and operating all the time, the split-screens provided each bi-directional video link as it was needed.

At any one moment, two of the upstream channels and the one downstream channel enabled each of the people interacting from two centers to see and hear each other and for all the rest of the people at all three centers (as well as home viewers) to see and hear them interacting. The next moment, the people interacting might represent a different pairing of centers, but again, those directly involved saw and heard each other and everyone else saw and heard them seeing and hearing each other.

Here the actual number of bi-directional video links operating at any moment is one, but it can be either A-B, A-C, or B-C as among three centers: A, B, and C. In order for this situation of serially-available single bi-directional video links to provide the capacity of three bi-directional links, the interactive model is dyadic; but, always alongside the single video links were actual multiple audio links because the system did provide the situation of "all hear all."

5. Once split-screens were introduced, the question of a criterion for selecting pictures -- and most sounds -- for downstream transmission had been answered: the person speaking and the person being spoken to. Often, but not always, they occupied the two sides of a split-screen.[16]

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[16] This does not imply there was someone other than speaker and spoken-to on the split-screen; often, there were single shots of one or the other.

Early Involvement of Elderly Participants

The resolutions noted above were arrived at over a lengthy period of time of which the 2-1/2 to 3-1/2 months preceding the formal opening of the system[17] were crucial, because it was in that period that senior citizens first were introduced to the system at the three NCCs. As time went on, there came to be more and more discussions on the system; about use of the system, or how the system was used to amplify and extend other events such as the opening of Horizon Center, and legislative hearings affecting the elderly. In the last six weeks of 1975, several "trial runs" were made of the sort of interactions which might become regular features on the system when it was in full operation after the start of the new year. Seniors were involved in all these activities in increasing numbers, but they did not leap into leadership positions overnight. The minutes of the staff meeting on December 19, 1975, carry the note "There must be a serious attempt to find senior citizens as chairpersons." It was not long after, however, that seniors were moving from passive roles as observers to active ones as participants with questions and then to "chairpersons" -- although, by that time, the roles implicit in "chairperson" had come to be divided between "host" and "presenter."

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[17] Kennedy Towers and Hensler Homes were operational from about September 15, 3-1/2 months before the January 9, 1976 formal opening. Horizon Center's construction was completed only in time for the NCC to start working on about October 15, 1975....2-1/2 months before Opening Day.

Session and Center Hosts: Gatekeepers and Arbiters

Both the staff and the senior citizens recognized a need for an overall daily session host; someone to announce the activities that were about to begin and to introduce the presenter or presenters who would begin them. Session hosts might comment or ask questions of presenters, note that someone else had a comment or question, and (although this took a bit longer to develop) cut off a long-winded presenter, and, finally, bring the session to a close.

It became evident that there was also a need for hosts at each center. Center hosts spoke for the groups at the NCCs (giving the results of polls, summarizing the consensus of people's attitudes about a subject under discussion, lodging a group complaint ("can't hear," "didn't have enough time today for this session"), and encouraged people to participate, by introducing them.

It was apparent that the hosts -- both session and center hosts -- were performing parliamentary and gatekeeping functions: maintaining order and encouraging participation. The real difference between the actions developed by the hosts and the actions implicit in various signalling devices that were briefly considered was the difference between local usage and superimposed usage intended for universal application.

The majority usage in Reading is characterized by respect for the speaker; it is understood that people do not take up the time of the group unless they have something to say. Hosts were able to rely on the politeness and deference characteristic of the usage in their mild exercise of control; open microphones in all locations provided, more than did video evidence, the auditory confirmation of co-presence that was required to exercise the conventions of group-talk. Rather than chaos, then, open microphones enabled communication as people expected it should be. The host also acted for the group in cutting off speakers who ran beyond the bounds of what they had to say and in changing subjects no longer interesting.

Staff Communication During Interactions

A private line (PL) interconnected the staff who operated cameras and other equipment at the NCCs with the switcher at the head end. All locations could talk and hear each other, to set up split-screens, inform the head end of technical problems, explain a noisy event going on off-camera, etc. Camera operators and the switcher at the head end wore headsets that provided an earphone and a small microphone positioned before the mouth. They needed their hands free.[18] The PL constituted a "back channel" of communication. Prior to its installation, the crew had to use the "front channel" of audio on the system. It had been fairly common to hear members of the crew come on over the entire system to discuss their problems. After the PL was installed, there were fewer such "backstage" conversations on the front channel of the system.

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[18] The centers at Hensler Homes and Kennedy Towers had one headset each. Horizon Center was responsible for some additional functions and so required two headsets. Staff at remote locations also were patched into the PL.

Home-Viewer Participation in the System

There were 117 homes with at least one person 65 or older which were set up to receive the interactions as one-way programs. As soon as the home viewers had been connected, they were encouraged to call a number which was answered at the head end by a senior citizen who was well known to many of the participants. In the system's first nine months, only people with Channel G converters could call.[19] If the caller said she or he had a comment or a question for someone being seen on the system, the phone answerer would inform the switcher, sitting next to him, who would tell the camera operator at the center from which the session host was presiding[20] that there was a home viewer on the line. The camera operator at the hosting center would hold up a card, "Home Viewer" so the host could see it. Soon, the host would break into the discussion to say that a home viewer was on the line and would request the home viewer to "come in." The switcher would switch the home viewer onto the system audio and the phone answerer would tell the home viewer that he or she was "on."

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[19] After September, 1976, the interactions were transmitted on Channel 3, so anyone with cable television could watch.

[20] Sometimes the Host would be at one location and presenter(s) at another. On "Inside City Hall," for example, Mae F. hosted sessions from Hensler; the Mayor and the other City Council members participated from City Hall.

The home viewer would then be heard throughout the NCCs and by other home viewers just as a person who spoke from a system location was heard.[21]

Visual Aids

Character Generator. At an early date, the system acquired a character generator, a device which prints white letters, numbers, and other standard typewriter characters on a black background. The character generator can store several "pages" of pre-set material for display as needed, or the characters can be shown as they are being typed, by the switcher at the head end. When a home viewer's voice was being heard, the legend "Home Viewer" was inserted at the bottom of the TV screen. The number for home viewers to call was shown over the system from time to time. If a guest mentioned a phone number or address for contact or information, it would soon appear on screen below her or his face. At short breaks between sessions, the character generator displayed "stay tuned for...." announcements and other bulletins of interest. Probably its most engaging contributions were ad libs such as "Happy Birthday," to someone who was at that moment on screen or stick-figure animations such as a van with rolling wheels that popped on in the middle of an explanation of the Red Cross's free transportation service.

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[21] Home viewers always were put on "live," not recorded to delay actual transmission and allow for censorship. To date, no obscenity or untoward abuse has been aired, although there have been a few occasions when the caller seemed to be confused or disoriented.

Graphics Camera. A stand-mounted camera pointing down on a flat surface displayed graphic materials which included session titles, spot announcements, and displays of forms while people at the centers or at home were being assisted in filling out their own copies. The graphics camera was used to show photos of Reading landmarks earlier in the century, to highlight newer items from the morning paper, and -- on one occasion -- to transmit the picture of a child who had been missing for several hours.

Videotape. Portable videotape units were used to record and bring back to the system scenes and events outside the centers, a function which comprised a great variety of activities and expanded the scope of what people could show, tell about, and discuss.

Who? The People in the System: Staff and Participants

Staff Responsibilities

Before the rest of the design had been worked out, staffing was understood only in the most general terms; but if operation of the system were to be seen as a structure, then the staff would be its first supports and stays--to be replaced, as much as possible, by the system's participants. One of the staff's basic functions was to train senior citizens who would then be able to replace the staff. In practice, this meant encouraging senior citizens to participate in more and more productive ways; an example was the progress of a senior citizen from active questioning and commenting, to taking part in the presentation of a session or two, to becoming a regular presenter of a regular series of sessions, to taking over production of the series. Local participants learned on the job, working alongside staff members and assuming responsibility for those aspects of the system which most interested them. Early in the experimental phase, senior citizens showed a distinct preference for planning, production, and "on-camera" responsibilities over operation of the technical equipment. From the point of view of staff qualifications, the training aspect of each position implied even more than the patience, understanding, and good cheer needed to create a friendly environment; staff were to be capable not only of analyzing the actions that went into organizing sessions and running centers but also of describing those actions to participants.

Staff Structure

Supervisory Staff. The director of implementation was responsible primarily for introducing, and maintaining the experimental system in Reading. Reporting to her was a full-time system coordinator who was the on-site representative of the consortium and managed the day-to-day functioning of the system. Neither of these were local Reading people. The proposal to the National Science Foundation explicitly named the Alternate Media Center's Executive Director and Director of Regional Access for these positions because of their previous experience with public access cable television. The director of implementation coordinated the activities of the local project staff with the Reading members of the consortium and directed the technical and organizational aspects of implementation. A critical function of this position involved explaining the system's objectives, substance, and methods to community groups, service delivery agencies, businesses, and private citizens. The system coordinator's main responsibilities were to hire the local staff, supervise the training, and organize the setting-up of the NCCs. The system coordinator could call on the staff of ATC's Berks Cable TV Co. on matters ranging from cable technology to advice and assistance in dealing with Reading's public and private institutions. On technical matters, the system coordinator had the additional help of an independent engineer who was hired as a consultant to the supervisory staff.

NCC Staff. Originally, each NCC was to have a full-time coordinator, three half-time technical aides, and two part-time senior aides (who were to be engaged once the NCCs had begun to make acquaintances in the community). Before the system was operational, however, it became clear that senior citizens would not be assuming many of the technical functions.[22] Therefore, it was decided to assign one full-time and one half-time technical aide to each NCC. By the summer of 1976, after six months of regular operations, the half-time technical aides had become redundant at Kennedy Towers and Hensler Homes. Horizon Center, because of additional responsibilities to overall system production, retained its half-time technical aide, who served usually as camera operator while the full-time aide operated the graphics camera (which was in constant use for brief announcements and program signature titles as well as for illustrative materials within programs) and was occupied with audio adjustments when Horizon Center extended its microphone coverage from the normal three or four to six or seven.

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[22] The simulation exercises conducted in summer and fall of 1975, as well as the staff training which preceded and followed them, are discussed in the Program Report of the NYU-Reading Consortium which was published in 1976. Simulation of the actual system was done at locations other than the NCCs, using the equipment which would be in the NCCs.

By late fall 1976, after the sessions went from one to two hours a day, Hensler and Kennedy were operated solely by full-time technical aides. (Horizon continued with a full-time NCC coordinator, one full-time technical aide, and one half-time technical aide.) All three NCCs employed senior aides or senior producers: Horizon, three; Hensler, two; Kennedy, one. After NSF funding ceased, Hensler and Kennedy were each operated by a half-time technical aide, and Horizon by two half-time technical aides. This period also saw the addition of some night-time programming. Senior producers and senior volunteers had assumed all of the NCC's non-technical functions.

The NCC staff, as well as all regular employees of the system (with the exception of the system coordinator and director of implementation), were recruited in Reading. This ensured that the contact staff would have a knowledge of and familiarity with the local community and that the system could continue to have a strong local support staff at the end of the experimental phase. All members of the NCC staffs had to be trained in the technical aspects of their jobs, which included operation, maintenance, and minor repairs, and daily set-up and check-out prior to the interactive sessions. The remainder of their responsibilities were subject to on-the-job learning and adaptation as the system developed.

Shared Staff. Initially, there were to be three full-time positions: an operations director, a program researcher, and a staff secretary. (A part-time librarian position had been planned but was eliminated before any staff was hired.) The functions of the operations director were assigned to a Berks Cable TV Co. technician. The position of program researcher was upgraded to production coordinator before the system's formal opening in January 1976; it had become evident that production activities had to be coordinated if the system was to sustain a program of interactive sessions five days a week. Program research was done by the people in charge of producing specific sessions. The staff secretary was responsible for performing a wide variety of secretarial functions.

Four other shared staff positions came into being: head-end switcher, social-service producer, remotes coordinator, and publicity director. The first was a full-time job; the rest were half-time jobs. The head-end switcher's role was assigned to a staff person who had been hired initially in anticipation of emerging but unforeseen needs. Head-end switcher was just such a need. Before the system was formally opened in January 1976, it was apparent that it would be difficult to organize sessions about major social services since no one on the local staff was familiar with the details of these services. Therefore, a retired social-service worker, who was familiar with both the social service procedures and the officials who administered them, was hired as a social-service producer.

The need for a remotes coordinator was not manifest until September of 1976 when additional locations were involved in the interactive sessions four days a week; other "remote" locations were also frequently scheduled. There was one kit of equipment, including camera, microphones, monitor, and modulator, which was regularly set up Mondays at the County Building, Wednesdays at Social Security, Thursdays at City Hall, and Fridays at different local high schools. The remotes coordinator had to set up the equipment each of these mornings as well as serve as camera operator and all-purpose technician.[23] Prior to September, remotes had been fewer and had been handled on an *ad hoc* basis (for example, one of the technical aides at Horizon Center would go to City Hall to help whoever was assigned to produce the "Inside City Hall" segment).

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[23] When the system was taken over locally in March 1977, the remotes director was replaced by the Kennedy technical aide on a half-time basis. Operation of Kennedy was taken over by one of the half-time technical aides from Horizon.

The half-time position of publicity director was added in May 1976. His principal job was to attract more senior citizens to the NCCs. The publicity director was to prepare and distribute a "TV guide" which listed and described the sessions as well as to set up regular contacts with local press and radio to generate interesting stories about the system and its activities in local media.

Senior-Citizen Participation

It was assumed that, once the NCCs were open to seniors and the interactive system was operating, a representative group of senior citizens would become involved and the design would then have to be adapted. No aspects of the design were changed so much as those which were directly affected by the participation of the senior citizens who arrived on the scene.

When the system passed to local control in early 1977, paid staff consisted of four full-time and five half-time younger people, as well as seven half-time senior-citizen employees. When the system became operational, in January 1976, there had been ten full-time and three half-time younger people, with six half-time senior-citizen employees. The system's ability to reduce to 40% of the initial full-time staff was even more striking when one takes into account that the hours devoted to interactions each week nearly doubled over the same period, and--due to shortening the lengths of time devoted to individual segments--the number of different series formats presented each week more than trebled.[24] Senior-citizen participants took over responsibility for production and presentation of almost all interactive segments.[25] It no longer was necessary for staff to hunt down presenters and guests, arrange for graphics, make up questions, or be concerned about next week's schedule.

Although younger staff were able to move out of programming, they retained full responsibility for maintenance and operation of equipment; but the combination of their increased technical skills and their understanding of how interactions were implemented by technology enabled the staff to develop considerable efficiency. It became a byword that a job initially requiring two people ended up needing half of one person's time.[26]

Senior-citizen paid staff. Senior aides were compensated on a formula that allowed them to earn a maximum amount before their

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[24] In early 1976, interaction time lasted an hour a day; by 1977, it had been increased to two hours, and evening programming was about to be added. Also, in early 1976, the one hour might be devoted to one or two separate formats. By late fall of that year, it was not uncommon to see seven segments scheduled. By March 1977, however, the number usually was five; participants had come to feel that there was too much emphasis on diversity and not enough on exploring subjects in depth.

[25] By September 1977, it was no longer necessary to qualify this with "almost." Seniors were in charge of all production and presentation.

[26] The Reading BCTV system was the first interactive telecommunications project, known to the author, where staff was conversant both with the workings of the electronic equipment and with the substance being communicated. Most staffs of similar projects tend to follow the mold set in broadcasting: programs are the business of "creative" people and equipment the business of engineers, both of whom speak languages unknown to each other. It seems probable that the maintenance of this dualism may mask inefficiency and redundant efforts.

Social Security payments were subject to reduction. Five senior aides were employed: three at Horizon, one at Kennedy, and one at Hensler. All of them performed the functions that had been anticipated: greeting and registering guests, explaining the system to newcomers, and making people comfortable. All of them also took leading roles in the interactive programming, and this had not been anticipated. In effect, they devoted a large share of their paid time to what had been thought of as volunteer work: producing and presenting sessions. This was a bonus because it helped the system to involve seniors in programming activity; the greeting-registering jobs were accomplished in a fraction of the time allotted to them.

Senior producer was a position that had not been contemplated prior to the involvement of the senior citizens, but was fully consistent with the aim of turning over the system's important functions to its participants. There were three senior producers, two of whom had started as senior aides at Horizon and Hensler.[27] Consequently, there were then three senior aides, as well. This group of six regular employees of the system, along with a growing number of senior volunteers, formed a large nucleus of senior citizens upon whom fell the major share of responsibility for interactive programming before the end of the implementation period.

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[27] The senior producers, all of whom were recipients of Social Security benefits, rejected a compensation formula that would have left their benefits undisturbed, and opted to be paid at higher rates. Initially, the planners had assumed that senior citizens would not want to earn more than the maximum allowed before their Social Security payments were decreased to reflect increased earnings. This assumption was incorrect. Senior citizens wanted to be paid what the job was worth.

Senior volunteers. Volunteers organized programming, researched information, and performed as presenters, resource people, panelists, entertainers, and hosts. They did not operate equipment or manage the centers. These latter tasks remained as non-senior local staff functions after senior-citizen staff and volunteers had taken over most of the other functions initially performed by the non-senior project staff.[28]

Senior home viewers. Mention has been made previously of home viewers calling in during interactive sessions and participating via telephone. The home viewers were recruited in specific neighborhoods for purposes of research. Originally, they were supplied with special converters for Channel G. However, in the summer of 1976, it was decided to alter the system radically and on September 27, 1976, reception of interactions no longer was confined to specific homes but was extended to all 35,000 cable subscribers: the interactions thereafter were transmitted on regular cable Channel 3.[29]

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[28] Overall management of the system remained a non-senior staff job, also. However, when operation of the system passed from the NYU-Reading Consortium to the Board of Berks Community Television, the system's new executive director began reporting to the board, which included a large representation of senior citizens in its membership, as did the Program Board, a separate entity with overall responsibility for programming schedules and policies.

[29] Consequently, the numbers of telephone call-ins from home viewers rose substantially.

The contributions of the management of ATC's Berks Cable TV Co. should be noted. Their cooperation and active assistance were essential throughout the project. The cable company management kept informed of the project's activities, made frequent suggestions as to ways in which its service could be strengthened, and often advised where to turn for assistance. When confronted with the project's interest in transmitting the interactive programming on a regular subscriber channel, the cable manager (who had been informed previously of the high home-viewer attendance) had only one question: "When do you want to start?" Subsequent interviewing of ATC's Regional Manager in charge of Berks Cable TV Co.[30] established management's reason for pre-empting former programming on Channel 3 in favor of the senior citizens' interactions: they believed it was an important service to their subscribers and to the city.

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[30] Earl Haydt, interviewed November 10, 1976.

CHAPTER 2

Programming the System: Formats for Interaction

The local staff had been warned that the presence of cameras, monitors, microphones, and loudspeakers would tempt people to behave in terms defined by the television they had watched over the past two to three decades. There was concern that people would see the NCCs as television studios rather than places where they could get together to communicate with each other. The need to avoid falling into the mindset of broadcasting--producing and presenting "shows" for viewing by audiences--had been stressed heavily during the training period. And yet, the communication environment of the NCCs was dependent on the use of television technology, which meant that certain aspects of television *as an organizer of information* were as pertinent in the NCCs as they were in broadcast studios. From the point of view of someone looking at it, any experience of television implies: a) watching a picture on a screen, and b) listening to sounds coming from a speaker.

From the point of view of transmission, television implies: a) selecting, from moment to moment, particular sets of pictures and sounds, b) being in (or not being in) the particular pictures, and c) being the source, or part of the source (or not being the source) of the sounds.

From either point of view, one's attention is focused on the frame filled with picture and on the sound coming from the speaker. Attention implies concentration, effort, or doing this rather than doing something else. It is assumed that something is being made to happen on the screen and in the speaker which is worth giving eye and ear to; worth thinking about and responding to.

Total Participation: "Singalong"

One popular activity appeared very early as the "Singalong." It was a natural and spontaneous use of the system as a place for people to get together for an activity in which everyone could participate equally. An NCC coordinator suggested the "Singalong," and from former experience as a camp director knew the simple ingredients it required: a pianist who could play the old songs, and a leader to settle which would be sung and to keep the beat. The coordinator became the leader.[31] The way to 'see' "Singalong" developed very quickly: the camera stayed mostly on a picture of the leader from head to knee, with the accompanist at the piano behind her. Once the leader had said what the next song would be, and had it going with a steady rhythm, the picture switched to a panning shot of singing faces at one of the other NCCs. What one heard was a mixture of many voices from all three centers, with an occasional dominant voice over all the rest from a louder singer close to a microphone.

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[31] After leaving the staff in March 1977, she came back every Friday to lead "Singalong" as a volunteer.

After a few sessions, the song-leader began to put together packets of lyrics to be used regularly in the NCCs on Fridays. As of September 1977, these "song sheets" contained scores of old favorites from love songs to marching songs, from "Avalon" to "Zip-a-dee Doo Dah." The "Singalong" format provided a solid base for musical and comedic departures: a solo or duet, round-singing with each NCC a different section, response-singing between leader and chorus and singing with signs and gestures. "Singalong" was the only format to retain a full hour's time period.

What is a Format?

"Singalong," although clearly taken from the traditional "community sing," was adapted in unique ways to interactive television. The manner in which it was experienced, seen, and heard was different from its face-to-face ancestor, and the local project staff could see that it "worked" very well in the interactive television environment. It was an excellent example of a programming format that had been tailored to the requirements of interactive television. Quite obviously, one did not simply invite people to the NCCs, turn on the cameras and microphones, and hope for the best. Yet, for some time it was felt that putting the senior citizens together with each other and with various other people (such as high school students) in a somewhat formalized situation (with recognized system hosts and NCC gatekeepers) would suffice to generate interaction--and would avoid the pitfalls of the broadcast metaphor.

This "open meeting" concept worked quite well when there were strong personalities who, by force of their own social skills and from their own understanding of the requirements of the subject matters at hand, organized the sessions and delineated the scope of the discourse, the kinds of questions and comments that fell within that scope, and the roles available to the participants. The "open meeting," when organized purposely so that people knew how to participate, was, in fact, an interactive format. Television technology organizes information and focuses attention. Because it is inherently so puposeful, it tends to dominate other visual and auditory aspects in its environment; therefore, what it focuses on has to be worth one's time and effort. People want to know, in advance, what it is going to focus on--and something of the way it is going to accomplish the focus--before they become involved with it.

Another demand is that the experience be dependably regularized; one will not tolerate for long not knowing what to expect on a television channel and will be even less tolerant if the effort includes going out to an NCC. Also, people are unlikely to commit substantial time and energy unless they have some notion of what to expect for their investment. The answer for an interactive television system like the one in Reading lies in manipulating the medium's inherent demand for structure by creating formats that organize television intentionally. A format is simply a particular structure, one that has a distinctive way of organizing the time and space of a session, whether it be a one-way broadcast or a two-way interaction.

A format for a series of sessions contains several key features and elements which are the same from one session to the next. These features include: name of the series, subject area, purposes, presenting personalities, setting, and duration; but what are most significant in formats are the organizing elements that define the manner in which participants relate to each other: they may ask questions, respond to questions, describe something being seen or being heard, sing, dance, or demonstrate; they may provoke laughter, provoke controversy, lecture, or ask for or respond to a request for a show of hands; they may behave in ways characteristic of public meetings, private conversations, attending a lecture, playing a game, talking with an official, friend, or celebrity; being in school, being at a party, storytelling, giving the news, and/or many others. The point is that any format will be distinguished by its key features and behavioral elements, whether the participants are behaving as themselves or as characters in a script. A format is definable and replicable. One usually can count on seeing it at the same time each day or each week and can expect it to have the same structure, purpose, and style that it had previously;

one knows one's relationship to it. As a participant, one also knows one's role and the range of possible behaviors one can perform within its boundaries.

Without the guidance and security provided by formats, the communication experience in artificial time- and space-bound media would be chaos. The project staff, together with steadily-increasing numbers of senior citizens, developed a variety of interactive formats which responded to the many and different needs and wishes of the senior citizens and service providers who participated in the interactive television system. The interactive formats did partake of broadcasting styles and manners in varying degrees, but not so as to inhibit interaction among the participants. The destiny of BCTV lay in enabling ordinary people to present themselves to each other in ways that they, and home viewers, found authentic, attractive, and interesting.

But the route to understanding and developing interactive series formats that could project interest and attractiveness was not a simple and easy one. A major roadblock to this understanding lay in the tendency to associate subject matters with greater or less attractiveness and interest. This tendency is not characteristic only of people who are just beginning to grapple with programming issues; it is on display every weekend on national television: the Saturday and Sunday "intellectual ghetto"--daytime hours when few people are watching. The obligation to program "serious" subjects is here discharged at minimal cost and with minimal loss of revenues; and programming is frequently accomplished in "talk-show" formats. Initially, in Reading, some subject matters were perceived as lacking in interest. It was not surprising that "serious" subject matters would be associated with the same talk-question and answer-discussion approach so frequently seen elsewhere.

But what happened in Reading was unusual. Because, in a few short months, staff and senior participants no longer had this conventional reaction to "serious" subjects, and they did not automatically consign such subjects to talk-show formats; rather, they learned how to make sessions interesting within the frameworks of talk-shows and they developed new interactive formats which presented both "serious" and "light" subject matters interestingly, and entertainingly, within the same session.

Discussion Formats: "Your Money and You," "Your Social Security"

One of the first breakthroughs in developing a lively and interesting series which dealt with serious, often difficult, subject matter was in the area of services for income maintenance such as: Social Security, Medicare, Medicaid, Food Stamps, and Supplemental Security Income. The basic principle underlying these formats was that older people should produce and present materials for interaction. Presentation by older people would assure that their points of view and attitudes would reflect, authentically, the nuances and conditions and the prejudices and barriers to understanding peculiar to older clients in Reading, Pennsylvania.

A seventy-two year old retired caseworker was hired through an ad in the Reading newspapers for a person who could both assist with the research about income maintenance services and contribute production assistance to presenters of sessions about those services. She could see the subject from both the perspective of the professional and that of the potential client; she, herself, was receiving Social Security insurance payments as well as whatever pensions or other (unearned) income which she was entitled to. Also, when she began to work part time for the interactive television system, she herself would be in the situation of the Social Security recipient whose insurance checks are reduced, by formula, against earnings over and above a maximum annual amount--a situation not uncommon in Reading's large population of elderly people. She embodied the primary features which the deceptively simple discussion format demands: complete authority and an easy, secure manner.

In both her weekly sessions, the half-hour "Your Money and You" and the 15-minute "Your Social Security," the producer-presenter said her name and the name of the session, and then introduced the day's topic and guest as if inviting one to ask questions of the chief figure in an important news item in the morning paper. The story and its protagonist immediately became interesting because the producer-presenter said it was important and she knew. The guest appeared beside her on the split screen; she asked her or him a straight and simple question, and now NCC participant and guest both knew how important the subject was: "We keep hearing that Social Security funds have been depleted to pay for other national programs. Does this mean our monthly payments are in danger?" or, "A lot of my friends who are eligible for food stamps don't use them because when they give them in at the check-out counter, the clerks are often rude to them and other people in the line make disparaging remarks. What are you doing about this?"

The moment the guest slipped into bureaucratic jargon, the presenter smiled and said, "What you mean is that nobody knows, isn't that right?" or, "Now let's see if we can't put that in English." If the guest forgot a fact or a number, she usually could supply it. If the guest made an inadvertent slip or got something mixed up, she would turn the incident into a joke, everyone would laugh, and the mistake would be straightened out. It was easy to ask questions to which no one had seemed to know the real answer. Under the ex-caseworker's guidance, not only was the right answer provided from the horse's mouth, but if the answer involved your getting an explanatory booklet or a form, or someone's signature, you and everyone else knew where it was coming from and who to call if it didn't arrive.

Discussion Formats: "Inside City Hall" and "What's County Government All About?"

"Inside City Hall" and "What's County Government All About?" followed the same basic format as "Your Social Security" and "Your Money and You." The host of these formats had been involved in national and local politics most of her adult life. Here again, the host was in her seventies and superbly well-informed and enthusiastic about her subjects. Each half-hour session started with the host's head and shoulders filling the screen. She introduced herself and gave the name of the session. The host invariably began with small talk or encouraged pleasantries. After a minute of this, the host got down to business--but another dimension had been added to the tone of friendly respect: an atmosphere of home-town cordiality that enabled both officials and citizens to get past the barriers of awe and deference with which titles like "Mayor" and "Councilman" ordinarily are surrounded. In the interactive television sessions, the mayor and city councilpersons were often addressed by first name. People talked with the officials and, when necessary, interrupted them, politely but surely, as they would friends. In establishing this informality, the host (and other hosts in other series) had not created something, but had pointed out, confirmed the intimacy that the interactive television environment seems to encourage.[32]

As soon as the moment of pleasantry had established the situation and atmosphere, the host asked a question, quoted a statement, or made an observation based on recent events, and she asked the city council member (or county official) to comment: "Councilman, your colleague tells us that row houses in Reading pay more than their fair share of taxes. If there's one kind of property that senior citizens own more of than any other, I'd have to wager it's row housing. It looks as if, once again, we're seeing a tax that falls heaviest on those least able to pay. What are we going to do to correct this situation, Councilman?"

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[32] See Park, An Introduction to Telemedicine, published by the Alternate Media Center, NYU School of the Arts. Chapter III summarizes some of the previous evidence for this assertion.

Such an opening tended to spark a lively conversation. Once she had set the course of the morning's discussion with city or county officials, the host encouraged participants at the three NCCs to carry on the line of questioning; but she kept close watch, subduing people who threatened to cross the line from criticism to abuse of an official, cutting off speechmaking by citizens and officials alike, pulling the discussions back on track, and introducing new approaches when conversations flagged. Like the host of any discussion, she was kept apprised of people waiting to say something from her own or other NCCs, and of telephone calls from home viewers. She used these waiting questions and comments to shorten her guests' responses and to keep other comments and questions brief.

Both the social service and governmental sessions seemed always to be too short because they were interesting and fast-moving. Therefore, it is worth noting that, in the beginning, the "Inside City Hall" sessions were slow-moving. At the beginning, the host sat side-by-side at city hall with the local government officials. This meant that any interactions between the host and the guest were "closed": they looked at each other, the camera saw the sides of their faces, people at the NCCs saw them from the point of view of outsiders. This situation did not invite interaction because the status of participants at NCCs was different from that of the city officials and the host-participant; the rest were interlopers breaking in on someone else's conversation. When the host and the official turned to camera in order to address NCC participants, the visual message was: "Now we will turn to you, out there." The host moved to an NCC and there no longer was an "in-here" - "out-there" dichotomy. Everyone--host, guest, participants--was "in-here," looking at each other.[33]

Discussion Format: A Summary

The most significant aspect of this format was the host, who had to have the security of knowledge and understanding of the subject as well as a firm and gracious personality. It became clear that the simpler the format, the more the success of the presentation depended on the person in charge. (It might even be correct to say that in very simple formats such as these, the personality of the host _is_ the format.) The host/single guest-short interview-and-open discussion format was the workhorse of the Reading system for social service and citizen-government interaction programming.[34] One year after the experiment was terminated and the Reading community continued to operate the system, all four series remained strong points in the schedule and the service agencies and local government have continued their cooperation as fully as ever.

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[33] For a detailed discussion see "Citizen-Government Interaction: An Observational Analysis" in this volume.

[34] Note that spot announcements, discussed later in this section, were also used in support of information about social services.

There were variations on the format:

1. Host interviews guest with little or no questioning or comments from NCC or home-viewer participants.

2. Host is also the presenter, giving a brief uninterrupted presentation before inviting NCC and home-viewer participation.

3. Host has two or more guests, who become a panel and enclose most or all of the discussion among themselves.

No series which used any of these variations achieved the popularity or stature of the basic format of the four cited series. (However, the third variation was effective in some single, non-series presentations.) It was observed that none of these variations either encouraged or permitted as much interaction by NCC or home-viewer participants as did the basic format. It may be reasonable to assume there was a connection between lesser interaction and lesser popularity and stature of the variations. Whether in the basic format or one of its variations, the dependency on the qualities of the host held true. The corollary was also true: the format had no mechanism to support a host who did not know and understand the materials with which he or she was dealing.

Interactive Quiz Format: "Sense and Nonsense"

During the simulation period in July 1975, the feasibility of having a game show on the system was discussed. The staff and participants recognized the need for having some programming that was primarily entertainment.

In considering a quiz or game for the system, most people used Bingo as a model: a format in which everyone could participate.[35] In the Reading system, this meant both the people at the centers and home viewers. There was general agreement that there should be some means of equalizing the differences between better- and less-educated people as well as between physically-impaired and physically-able people. To a certain extent, this meant equalizing education and physical differences between younger people in their sixties and older people in their eighties and nineties. Inasmuch as the group which assembled at one of the NCCs was somewhat younger and more mobile than the groups at the other NCCs, it also implied equalizing differences among the centers.

The quiz game which emerged was developed principally by senior citizens and staff members. Basic issues were identified which had to be resolved within the span of four working sessions. The basic issues and resolutions were:

1. Should it be a competition among individuals or NCCs? (Both. A qualifying round with everyone playing would establish winners at each NCC. These three would then represent their "home" centers in a final round. Everyone who played would get a door prize. Each NCC winner would get a finalist's prize, and the top winner would get a grand prize.)
2. How could the differences between better-educated younger and less-educated older participants be minimized? (Use a number of questions about old-time Reading and Berks County before World War I, and about life and times in the first fifteen years of the century, about places and activities no longer on the scene.)

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[35] A variation on Bingo called "Soup's On"--with the aim of scoring a line of five items that made a balanced meal--was tried twice and dropped; as a format for interactive television, it proved to be not entertaining, but tedious.

3. How could it be assured that there would not be a premium on physical skills and quickness? (This was the solution developed by the entire staff, after dry runs: Contestants, in the qualifying rounds, would answer by holding up cards--A, B, or C for multiple choice, or True or False, with several seconds to respond. In the three-person final rounds, where someone had to be the first to give a correct answer to a question, each contestant would have a noisemaker of her or his choice--a horn or whistle, hand bell or clapper, buzzer or other sound signal. The first contestant who signalled readiness to answer would have reasonable time to respond.)

4. How could it be made sure, in the three-person rounds, that there was a clear winner, and infrequent ties? (Give different numerical weights to different questions, based on difficulty.)

5. How would the score be kept and how would everyone know the standings? (This is the routine that evolved, after some dry runs: During the qualifying rounds someone at each NCC kept score for the contestants there. At the end of a qualifying round the NCC scorekeepers each announced their local winner. During the final rounds score was kept at the head end by the switcher, on the character generator. After each question, he flashed the scores of all three contestants on the screen.)

6. How would home viewers participate? (A separate game-within-a-game was devised: A photograph of a local landmark was covered up with jigsaw-fitted shapes. From time to time, this was shown on the screen, and each time one more of the covering pieces was removed. The first person to call in with the correct identification was the winner.)

7. How would the information needed for the session be managed? Where would the questions come from and how would they be categorized? (The NCC coordinator found some quiz books, and supplied almanacs and other compilations of comparative facts. Someone suggested a category of questions based on social service and other facts that had been given over the system during the past week, as an audience-builder for the project. Contestants could be asked to identify and sing the first line of a song from last week's "Singalong." Finish the last words of a homely saying. Identify early pictures of famous people and local celebrities. Nonsense questions would be based, not on what you knew but on what you had done today or yesterday--a premium for good nutrition and health habits: Did you refrain from smoking?)

There were many more issues and there were stages in resolving them: during meetings, dry runs, and early weeks when "Sense and Nonsense" actually went on the system.

One of the senior citizens who had helped plan it became the host of the series, which ran from 10:30 to 11:00 a.m. every Tuesday. After an art-card with the series title, the host appeared on the screen, greeted viewers, made a brief statement about the day's session, asked if participants were ready at the NCCs to play "Sense and Nonsense" (camera shots of all three NCCs confirmed that the players were ready), showed the home-viewer's picture-puzzle, (hidden except for one exposed portion), reminded home viewers of the telephone number to call, and gave the contestants their first question in the elimination round: "You must apply for the new 1977 Social Security benefit increase. True or false?" The answer to this question had been given earlier in the week. Hence, people who had participated in "Your Social Security" would know the answer. (Many of the questions were based on information given in other programs.)

The host asked more questions: a multiple-choice on old movie stars, a nonsense question: "Did you have a meal with a friend last week?" ("Yes" was worth a point), a true-false question about Reading history, and a multiple-choice question on the final date for filing Medicare claims. The NCCs totalled their contestants' scores. If there were any ties, the host could ask another question. The three

NCC finalists were then chosen for the final round. In the meantime, more of the home-viewers' puzzle was exposed; perhaps someone had called and identified it, but usually it was not correctly identified until later in the game. The program opening and preliminary round took almost half the time of the session, but everyone had the chance to participate and to enter in the spirit of the game.

In the final round, the host asked a wider range of questions, which demanded more specific answers; there was less chance for guessing when she asked "Who said, 'I regret that I have but one life to give for my country'?" or "What organization, other than the Red Cross, provides free transportation for senior citizens?"

During this round, the picture changed rapidly among the host and the three contestants, going immediately to the contestant who first used a noisemaker to signify she or he had the answer to the question. If one contestant gave the wrong answer, either of the others still had a chance. The switcher was referee as to the order in which the contestants had operated their noisemakers, because he saw them all, on the TV screens in front of him at the head end.

During the course of the final round, as more of the picture puzzle was revealed, someone would usually call in and win a prize for correctly identifying it. The host used as many questions as possible with the NCC contestants down to a minute before the end of the session, named the winner, showed the grand prize, thanked everyone for participating, reminded NCC attendees and home viewers that they had another chance in a week, cited the rule that that day's winner could not be a finalist again for a month, and invited everyone to the next session, about to begin.

Interactive Polling

The idea of "Tri-Channel Poll"[36] was to urge people to express their opinions about controversial issues: Should abortion be legalized? Should draft evaders be pardoned? Is Barbara Walters worth a million dollars a year? Was Patty Hearst the criminal or the victim? One of the co-hosts stated the questions and the other stood at a large blackboard to tabulate the responses. The question was proposed, and then a show of hands for both the affirmative and the negative was called for; each NCC was shown on camera, and the center's gatekeeper called off the pros and cons. The co-host at the blackboard chalked in the numbers under the center's name, opposite a keyword for the issue. Then, one of the co-hosts counted hands at the hosting center. Then, the team went on to the next controversial issue, stated the question and asked for a show of hands. However, the raising of controversial issues sparked controversy; people wanted to voice their opinions in greater detail than a simple yes or no.

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[36] The system was called "Tri-Channel" from May to September 1976. Then, in anticipation of its interactions being made available to all of Reading and adjacent suburbs, its name was changed to "Berks Community Television" (BCTV).

For several weeks, one of the co-hosts would unbend the format only to the extent of clarifying the issue with examples, usually from news items. His argument was, quite correctly, "That's what an opinion poll is. You don't see Gallup and Roper asking for explanations from people. They just want to know how they'd vote if the issue was on a ballot." Contentions to the contrary by other participants and staff were that the Reading system didn't have to squeeze results into a column of newsprint and, anyway, the people at the NCCs wanted to argue their opinions. Finally, a purely practical consideration allowed debate: it was running out of good controversies. The co-hosts used up seven or eight a week, at least, because the format exhausted each item in about three minutes of stating, classifying, voting, and tabulating. If a controversy were debated it could take the whole half-hour. (It never came to that.) Debate was now encouraged and, with difficulty, closed out after six to eight minutes on each issue. The poll then proceeded, as before. This meant that four or even three issues would suffice. The series became more lively and it was less difficult to find the controversial material it required.[37]

Now a new dimension was developed by one of the co-hosts and added to the format. He combined the opinion poll/debate format with a soap opera! In the "Saga of John and Mary," NCC participants and home viewers were asked to help a young American couple resolve some of the issues of contemporary life. Each week brought a new crisis. Points like these were hotly debated:

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[37] Interaction level rose 32% (on a rating that was devised for and kept by the switcher at the head end) in the series' last eight weeks over its first eight weeks. (See Appendix B.)

1. Mary was Christian, John was Jewish. Should they get married? (Obviously the majority of participants said "Yes," because the story proceeded.)
2. Mary's employer offered her a raise--more money than John was making; but the new job meant moving to another town, his giving up his job. Should she accept?
3. John wanted Mary to give up her job, stay home and raise a family. Should she do this?

The "John and Mary" story-and-opinion poll sessions provided a natural introduction to an interview-and-discussion format about the issues raised in the saga of the young couple. The other co-host now brought in local experts or made his own presentations, to encourage extended conversations about such subjects as: changing manners and morals, the role of the family today, and Women's Lib.

Open Meeting Format: "Is There a Generation Gap?"

The format of "Is There a Generation Gap?" was at first obscured; it became lively and interesting only when its basic structure emerged. The idea was to bring senior citizens and high-school students together on the system. Each week, participants at the NCCs would meet with a group of students, usually a social science class, from one of Reading's high schools or nearby Kutztown High School. The host was Reading's immediate ex-mayor, a vigorous man in his seventies who had been a professor at Reading's Albright College before entering politics.

The apparent premise implicit in the title--that seniors and students had something to give each other--took much time to fully develop. Initially, the sessions emphasized specific questions which were put to the students and similar questions which were put to the seniors on alternate weeks. But the series finally came alive when the high-school students reached past the posed questions and started to ask their own questions, directly, of the seniors. One general question which permitted this breakthrough to occur was: "Do children have less respect for their parents than they used to?" The high-school students, not the host, pressed the older people to tell what it meant to have respect for one's parents when *they* were young people--teenagers, like themselves. The two groups of people, young and old, were finally talking *to each other*. And that was what the underlying format always had implied.

In the format that finally emerged, "Generation Gap" demanded of the host a level of understanding similar to that required of the hosts of the social service and government series. However, in this format, he is not mediating between an expert and a group of interested citizens; he is mediating between two groups of interested citizens and two groups of people who are experts, about themselves. Once "Generation Gap" started to become very popular, the host's job was to get things going on a good track and make sure everyone got the chance to talk.[38]

Formats for Spot Announcements

Over seventy different institutions and groups appeared on the system. When contact first was made between the system and a local institution or group, the assumed objective usually was cooperation in presenting an interactive session to inform senior citizens about the organization's functions or a specific program. But often, an organization's purpose was limited to telling people about a single function or service. Once such a simple need was apparent, and the system's obligations to provide information could be well-met by responding to it, staff and seniors' creativity in making spot announcements came forth, in abundance.

Spot announcements were generally produced in one of the following formats:

1. Personification. Animals, machines, objects that took on human attributes. Two motor vehicles, hoods up (for mouths) are talking about their busy lives. One is a van that rushes about town, picking up old people and taking them where they want to go. In the course of the dialogue, the essential facts of how to obtain the service are quickly revealed.

2. Personal endorsement. The "I did it" or "I have a friend who did it" approach. The conclusion is: "It didn't hurt and it was good for me. Now I'm glad I did it." An effective way for well-known people to encourage getting a vital medical check-up, signing up for an activity, looking into one's eligibility for benefits, or doing anything that requires the individual to take initiatives in the direction of something unknown or untried.

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[38] Brief characterizations of twenty interactive formats are found in Appendix C.

3. *Nostalgia*: Using a familiar local scene, pictures of children, or a softly-lit interior encouraged people to extend themselves to help others, as in volunteer work. Also used in the Reading system to encourage people to get vital medical check-ups (in order to go on enjoying the good things of life).

4. *Straight appeal*. This is quite similar to personal endorsements, with the salient difference that the appealing personality simply says, "I *want* you to do it." Tended to be used to get people to attend a new series of interactions, or a special one-shot "important" session.

5. *Unusual appeal*. This type, which usually incorporated tongue-in-cheek or straight-out humor was frequently attempted and often executed well. It was not associated with the "serious" purposes of social services so much as with general program and activity announcements. A leaning ladder, a black cat, a Pennsylvania Dutch Hex Symbol: these led to a session on superstition. A pinball machine, ball bouncing around, served as a metaphor for life: Would you get a good score, or would the machine go "Tilt"? To help get a good score, take the advice the spot was advocating.

6. *Mini-drama*. One, two, or three people in short scenes "from life," musing about or discussing the values of pros and cons of taking a particular decision, participating in an activity, or taking advantage of a service. a) A woman turns to camera from dusting a lamp shade: "I've just been thinking about...." b) Two women are talking: "Did you hear about....?" "No, I haven't. What is it?"

. *Voice(s) over artwork or graphics*. This type of spot was used every day for program promotions (with the program's own distinctive logotype) or for very brief announcements of the "Don't forget..." variety, with telephone number, a person or place, name and address, or name of the activity or service that was being promoted.

Numbers 1, 3, and 5 were most frequently done as "voice-over" spots. The visual scenes were videotaped, and people read the voice parts, either at the same time as the photography or before or after it. Numbers 2, 4, and 6 all imply synchronous sound: people talking as they are being seen.

CHAPTER 3

Observation and Recommendations

From the earliest planning stage, the Reading system was regarded as an evolutionary model. A principal aim of the design was to enable users to establish communication conventions and protocols that were authentic to and consistent with their own priorities, idiom, and sensibilities. No one had a formula for a communications structure that would enable the precise expression of these intangibles within the technologically-mediated communication environments of interactive television. If they liked the system and wanted to use it, the participants were going to be engaging in a process of trial and error in attempting to communicate via the system. Therefore, recommendations were aimed at the following:

1. Technical adjustments and physical arrangements for improved perceptions and improved capacity for expression.
2. Protocols and conventions for improved utilization of the communication environments.
3. Standardization of methods. (Recognizing constant factors in the interactions, many of which were being met and acted upon as if they were new and different each time they arose; pointing to methods which treated them uniformly each time.)

Methods

The author regularly attended sessions at all three NCCs from the time the system was activated in the fall of 1975 to the end of the experimental phase in 1977. Seated where he could see what was happening in the NCC and on the monitor, he did not participate but observed events from the point of view of one broad question: are participants and staff able to do what they want and need to do to interact and facilitate interaction via the system? If yes, what are the actions enabling interaction? If no, what are the problems? A large number of conversations and interviews with staff and participants checked on the impressions received by observation. In addition, participants and staff were engaged in discussions about their purposes and their perceptions of the interactive system.

Technical adjustments. Although the workings of technical equipment, the physical spacing of equipment relative to people, and the methods people used to organize their communications were inevitably interrelated, it was ordinarily observed that one factor or another predominated in any given problem situation. The category of technical adjustments included lighting as well as picture and sound equipment.

Physical arrangements. The spatial relationships among people and technical gear were critical for people's seeing and hearing; they were equally critical for their being seen and being heard. Over and against those sets of considerations were the comfort of the participants and the ease of operating the equipment by the staff.

Protocols and Conventions. The methods by which participants, presenters and hosts conducted affairs among themselves can be considered one set. Another set was concerned with the ways participants conducted themselves in relation to the technology. Still another was the way the operation of technology was organized vis-a-vis the participants. Finally, there were compound sets.

Standardization of Methods. Whenever common factors were being treated as new entities or events when they appeared, they were identified as common, or similar. There were a number of standard efficiencies that were usefully suggested to the staff, as the problems that had prompted them in the evolution of broadcasting appeared in the evolution of the system.

Approximately 65 suggestions were reviewed with various staff members. A representative sample is recounted, for illustration:

Technical Adjustments

Use split screens. A split screen is two pictures, from two different cameras (which meant, in the interactive system, from two different NCCs) side-by-side, divided by a vertical boundary in the center of the frame. The need for pictures of both partners in a dialogue had been voiced during the simulation period by the then production researcher when he said, "I want to see the person I'm talking to." The unavailability of more than one downstream channel precluded meeting this request with separate monitors for separate pictures of the interacting participants; the remaining solution was to put both pictures on the same monitor.

The suggestion to implement use of split screens raised a number of issues and questions: (a) it was not possible without technical modification; (b) it was artificial--people don't talk together by looking out of a monitor; they look at each other; (c) it was felt important to have full-screen reaction shots of people listening to the speaker, and the split-screen would interfere with showing them; (d) why put the interactions side by side--why not top and bottom? (e) why not split the screen three ways, for each NCC, or four ways, when an additional location participated? (f) it was difficult to line up the shots of the two participants.

Objections had to be answered: (a) Split-screens required phase-locking--eliminating the time differentials among pictures arriving at the head end after traveling varying distances from their originating locations. The consulting engineer overcame this by delaying signals from nearer points to match the arrival time of the signal from the most distant point. (b) Yes, it was artificial. Everything about television, however, is artificial. We happen to have accepted, as conventional, most of its artifices because they were the same as what motion pictures had accustomed us to--disembodied heads, people coming into or going out of frame, cutting from one picture to another movement of the frame of the picture, among others. The capacity for television to establish eye-contact between speaker and listener while they speak, and to allow others to see them and hear them at the same time they see and hear each other is owing to the fact that "live" television operates in synchronous time--a capacity unique to television, not possible in the film medium.

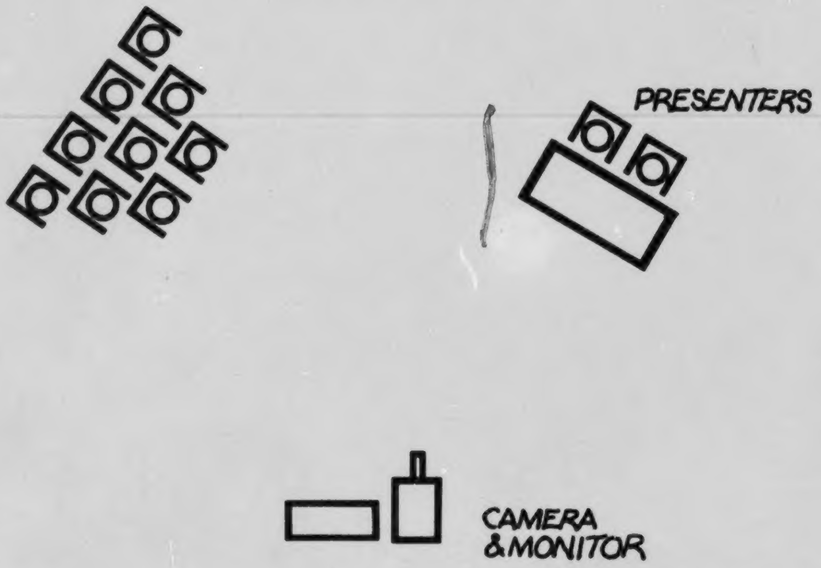
(c) Reaction shots and split-screens, although mutually exclusive if reaction shots were defined as full-screen pictures of people, were not in conflict. Reaction shots should indeed be used during the course of an otherwise non-interactive demonstration. Split-screens were intended to serve the requirements of conversation, dialogue, rapidly-moving interaction. (d) Top and bottom split-screens are proportionally inefficient and unattractive; the human body, even just head and shoulders, is a vertically-oriented mass, and top-bottom splits squeeze this verticality into horizontal boxes. This means that the head always must be smaller in relation to the picture frame than in the side-by-side split, and that the spaces on the sides of the frame are inactive and "wasted." Furthermore, in top-bottom splits, someone is on top and someone beneath, an arrangement whose negative connotation of superior-inferior does not go unrecognized. (e) Three-way splits are not impossible to do from a technical point of view, but pose compositional problems: three vertical splits, side by side, become so narrow that figures are overcrowded, but two in either top or bottom and one in the other half of a horizontal split means unequal spaces for equal people. Four-way splits are relatively democratic in composition but so reduce the sizes of each individual as to render them quite featureless. The most important consideration, though, is simply "Why?" Why insist on arbitrarily stuffing the frame with representative heads from everywhere, when the focus of any dialogue at any one moment is on two people? (f) It is, indeed, difficult to line up shots of participants unless there are standardized arrangements for doing so. This standardization was the subject of another recommendation which is taken up under "standardization of methods" below.

Investigate use of lens extenders. Lens extenders are inexpensive close-up attachments, of 1-, 2-, or 3-diopters, which greatly enhance magnification. The reason for this suggestion was the observation that some items which presenters were attempting to demonstrate were too small to be seen by ordinary camera close-up capacity. The suggestion was not implemented during the 14-month experimental period owing to pressure of more important priorities.

Physical Arrangements

Seat participants and presenters in V-shaped arrangements before the camera-monitor units. (See Figure 2.) The camera "sees" in a

FIGURE 2


PRESENTERS
CAMERA
& MONITOR

wedge-shaped pattern whose apex is at the lens. Thus, the seating arrangement conforms to the camera's view. In addition, when host and presenter(s) are in a small, separate group at the apex of the wedge, both they and regular participants tend to look at each other on the monitor screen, rather than turning in their seats to address the other "in person." (In the early days of interactions, presenters sitting in the front row at Horizon Center turned around to discuss things with participants there--treating the participants on TV to their backs. When separated, but seated at right angles to participants, presenters still turned toward in-house interactors. Finally, seated at a shallower angle, with a good view of the camera-monitor units, both presenters and participants looked at each other on the screen, rather than turning and showing backs or sides to camera.) Finally, the large groups at Horizon Center, in particular, were isolating themselves from the other centers by turning away from the camera-monitor units. The wedge-shaped seating arrangement helped foster better inter-center communication.

Devise explicit boundaries for NCC space. At Kennedy and Horizon, the NCCs were in spaces larger than what was required for interactive television activities. The NCC space at Hensler was more than adequate, but it was devoted exclusively to the television interactions; the other two were in multi-purpose areas. Boundaries in the form of hospital-type movable screens reduced the size of the space at Horizon, but in containing the space, they also seemed to exclude people from it. To newcomers, what was going on "behind the screens" was none of their affair, a private party. The screens were abandoned, finally, when this effect seemed more deleterious than the barn-like space which encouraged some to be spectators, voyeurs, rather than participants.

At Kennedy, the large community room was lobby, lounge, reading-room, gathering-place, and lunchroom, in addition to being an NCC. No matter how the furniture was arranged, it had to include the tables which were later to be set for lunch, and NCC participants always were exposed to the clatter of meal preparations and various competing discussions around two sides of the NCC space. The lesson of this experience was hardly unanticipated: no matter how much it may benefit from proximity of activities that make the general area or building an acceptable place for its clientele, the NCC needs to have its own recognized and inviolate space; it needs this not only during transactions but for substantial periods of time before and after them, in order to organize activity and enjoy whatever ambience is unique to the space and the people in it.

Protocols and Conventions

This category contained the largest number of items, by far, principally because it subsumed recommendations about:

Language conventions
Leadership and presentation behavior
Group interaction process
Visual conventions
Auditory conventions.

Use panning shots for specific purposes. The following recommendations were not all made at the same time, but because they all deal with the horizontal movement of the camera head, they are grouped together. This is a good example of the role of context in defining the purposes of actions. A "pan" (or panoramic lateral movement) shows a sweep of action or scene. In the Reading project, it usually revealed a succession of people's faces, in close-up, or of their faces and upper bodies, if the camera shot was wider.

Although the pan is a familiar camera shot, it is still an experience that only a camera lens permits; and it is always potentially dramatic and exciting because it reveals what was previously hidden and unknown: people's identities, their relationships, their attitudes and actions. Consequently, to use a pan without purpose, is to waste and trivialize its potential. The staff camera operators and head-end switcher had seen, in their training, that camera movements and varying shot sizes always conveyed some meaning; one of the tasks of supportive intervention was to summarize the meanings that emerged in the context of interaction, to attempt to categorize some of them, and to clarify what may have been confusing about them.

1. When there is a good-sized crowd at one of the NCCs and the time is right to emphasize that a lot of people are there, pan on a medium shot that reveals a new person "on screen" as the camera moves off another one. Pulling back to a wide shot of the whole group will not articulate "a lot of people" as the panning shot does.

2. When going from one speaking participant to another one at the same NCC, pan fairly quickly on a rather tight shot. This increases a sense of vitality in the setting, shows that the camera is searching for the "new" voice, and may help to conceal the fact that there are but few people in attendance.

3. A slower pan of close-ups is effective in reminding a speaker that there are people at all three centers, some of whom may wish to speak.

4. On total participation programs like "Singalong," panning on closeup at all three NCCs (intercut from one to the next) increases the sense of identification of all with each; and becomes a vivid roll-call of the activity.

Keep staff members off-camera. On some days, at first, the only person visible at an NCC might be the coordinator. But, as soon as there were one or two people at an NCC, even if they had nothing to say, it was better that they should be on camera than a staff person. They were not going to learn that the system was theirs, and depended on them for what it would be, if staff people were there to "take care of things."

Visualize presentations with the actual items being discussed. This suggestion was not needed by people whose presentations included visual aids. During a session advising people to know about labels and contents of medicine bottles and boxes, as well as methods for assuring they would not be confused, it became evident that an otherwise informative session had lost the greater part of its effectiveness because the items discussed were only talked about; had they been shown, the number of the presenter's words would have been cut by two-thirds, and the participants would have retained far more of the information. The presenter should have brought an array of the bottles and boxes she was talking about to the session.

Standardization of Methods

Whenever people begin to use a new communication environment, they have to learn its ordinary conditions and how to distinguish them from singular events. Many of the foregoing suggestions were based on situations which recurred often enough to be assumed inherent to the system. There were, in addition, a few simple standard methods of doing things in television studios which had been developed in broadcasting and--because the operation of the NCCs was a form of studio television, no matter how successfully infused with a home-like ambience--these were patently applicable.

To line up split-screens quickly and uniformly, each camera operator should mark a vertical mid-line on the viewfinder with a wax pencil. As soon as split screens were to be used, this old studio method was suggested. The camera operator simply measures to find the exact center of both top and bottom of the viewfinder, then draws a vertical line with wax pencil to connect them. The switcher at the head end makes a split screen from cameras at two NCCs, then from the other combinations of two. The camera operators can observe, on their monitors, whether the head end is making the split on the lines they have drawn. There should be little deviation; however, if there is a discrepancy, camera operators and head-end switcher can resolve it by talking among themselves and, if necessary, adjusting their vertical lines slightly. Once this simple step has been taken, there need be no further discussion among camera operators and the head end as to the area occupied by each operator's picture.

Once the operator knows that her or his camera is to provide the left side of the split screen, then the operator keeps the subject in the left half of the screen, bounded on the right by the pencil line.

The switcher at the head end may still need to tell one operator or the other to tilt up or down, or to zoom in or out a bit, in order to balance the two pictures relative to each other, but the major task has been done when the two subjects (usually people's faces) are routinely centered in the pre-marked halves of the screen. The staff did not actually use this technique regularly until April, 1976. Once they adopted it, they were able to produce split screens at a moment's notice; but prior to that time, each split screen was a special event, requiring discussion and much adjustment before it was properly set.

Limit print on screen to 21 characters per horizontal line. This was a rule-of-thumb for most type-faces. The number of lines on screen at any one time should not be more than five, and less is preferable. These arbitrary recommendations came from the reasonable assumption that when print is used, it was intended that it be read. The original size of the print had nothing to do with it; all legends become the same size when they fill a television screen, whether they are photographed from a billboard or a postage stamp.

CHAPTER 4

In Conclusion: Interaction's New Domain

The Reading cable system developed an aspect of interactive television different from any previous use of IATV. When the daily interactive sessions were transmitted on a regular cable channel five days a week, they were accepted by a substantial number of viewers as a new kind of television programming. The Reading interactive programs are effective because the senior citizens who do the programs are not simply performing on one-way television. The two-way television they are using allows them to communicate with each other in a manner that is different from either face-to-face interaction or one-way television.

The "interactiveness" of the television programming seen and heard at home is further enhanced by the fact that any home viewer can become a participant via the telephone. The role of these home callers is different from that in broadcast television or radio call-in programs. In the latter, a home caller talks with the program host or, sometimes, a guest interviewer in the studio. In the Reading cable system, a home caller talks with host, presenter, guest, or any other person at any of the NCCs or remote locations; the home caller becomes one of the group-talk participants. Also, in the Reading system there is no use of a tape-recorded delay on conversations that include telephone callers; such a delay cannot be used in spontaneous conversation, and has never been even considered for use in the Reading system. The quality of home participation in the Reading system is of being in the group-talk, and of bringing a wider dimension to it from the larger population outside the NCCs.

When the Reading project was planned, it was hoped that people would come to the centers in order to communicate with each other and with local officials, educators, service providers, representatives of recreational and cultural agencies, and members of community groups (such as high school and college students). The people who came to the centers fulfilled this goal; they did communicate with all these people and communicated with them very well, but not solely because they needed the specific contents of all the communications that transpired. It is likely that the regular attendees at the NCCs were also there for quite different but equally important purposes: for socializing with each other, for involvement in group activities, and for participation as responsible and productive leaders of a community activity.

In other words, the Reading IATV system evolved as a surrogate system: the "regulars" interacted with local officials, social service agency staff, young people, physicians, educators, yoga instructors, ministers, and priests to learn how to use social services, how to buy and cook food on limited budgets, and to question elected officials about all manner of things. The participants determined not only what issues were talked about on the system but also how they were discussed. It was this latter aspect that was the more important, because it set the level of discourse in an idiom that is known, familiar, and true to people in Reading, Pa. The level of discourse that was set by the regulars, the wit and clarity they brought to the interactions was evidence of their collective skills as communicators to their neighbors and fellow citizens.

It was this authenticity that would seem to be the reason for local officials and politicians to pay so much attention and give so much of their time and energy to the BCTV system...off the air as well as on it. City officials, social service executives, local business leaders, and volunteer groups came to recognize that BCTV offered an audience that was valuable to them and to what they were trying to accomplish. BCTV gave the people access to their leaders. By the same token, it gave leadership access to the people. For the regulars, BCTV was a productive and meaningful activity.

Many personal testimonials were voiced on the system during regular sessions as to the value of the system in people's lives. The effect of the system on the lives of others was obvious: they came every day and worked hard to get programs together. The efforts and enthusiasm, innovations and inventiveness of the regulars over the long period in 1976 and 1977 in which the future of the BCTV system was in doubt, gave daily proof of how much it meant to them. Their appeals for money and support were moving and immensely effective. The consistent appeals over the system included one person with a huge chart of remaining hours, each one blacked out as it came to an end; and another with exhortations to "get out there and talk to everyone you know about keeping BCTV alive"; all of them, working for the system to keep going.

BCTV demonstrated that a two-way cable television system could be for people. Cable television systems, while looking for ways to serve, want also to capture sufficient numbers of people to pay for the service. BCTV may have provided one model for what is wanted, and needed.

APPENDIX A

Glossary

Host: Gatekeeper, spokesperson, chairperson. A host in the sense of one who represents an institution. Session hosts were in charge of the entire two hours of "programming" throughout the system. Center hosts were gatekeepers and spokespersons for individual NCCs usually for the entire session on any day.

Participant: Anyone who came to an NCC during a session, whether he/she "spoke up" or not, but usually refers to people engaged in active participation. Includes presenters, producers, hosts, guests.

Presenter: A master/mistress of ceremonies for a single segment. Introduced segment, its subject matter, guests, videotapes, and other elements. Led in questioning (of guests or other participants).

Programming: A somewhat unfortunate usage because of its connotation of broadcasting practice, but now widely used in the Reading system to denote the substance of interactions; the overall subject of what is to be scheduled in segments and sessions.

Segment: A term whose use declined in Reading. An early equivalent for what would be called a "program" in broadcast television. A part of a session, from five minutes to a half-hour (in the case of "Singalong" and some specials, a full hour).

Senior Aide: A senior citizen who worked at one of the NCCs greeting guests, seeing to it that the log book was signed by guests, and generally helping with the housekeeping tasks of the NCC. Also, the person who answered the telephone at the head end.

Senior Producer: A senior citizen who was paid on a part-time basis for producing segments. (Not all segments were so produced. Many were done by volunteers, senior and other.)

Senior Staff: The senior citizens who worked on part-time salaries as senior producers and senior aides.

Session: Originally meant to denote the entire hour or two hours scheduled for interaction and used in that sense here.

APPENDIX A

(continued)

Staff: The group of part-time and full-time younger employees who were recruited in Reading and served as NCC coordinators, tech aides, production coordinator, head-end switcher, remotes coordinator, staff secretary.

System: Always refers to the interactive television system and usually includes the concept of the people who operate and participate in it, its interacting locations, and its technology. (On occasion, the ATC-Berks Cable TV Co. is referred to as the "local CATV system" to distinguish it from the interactive system.)

APPENDIX B

Statistics of Attendance and Interaction

Logs of attendance were kept daily at each NCC, by program (segment). The switcher at the head end rated each segment on a 3-point scale for interaction (1 = very little or no interaction; 2 = moderate interaction; 3 = considerable interaction). The senior aide who answered telephone calls at the head end recorded, by segment, the number of callers who actually spoke on the system (as opposed to those who called but did not get on). Finally, a log was kept of transmission and sound problems. The following four tables summarize the data that were recorded.

Table 1 indicates the relatively low level of attendance at the NCCs. The total number of individual attendees for the year, 1976, was 1084, as shown in Table 5.

Table 1

Program Segments In Order Of Mean Attendance Over The Year 1976

1.	Is There a Generation Gap?	35.36*
2.	Singalong	32.29
3.	Adventures in Maturity (Red Cross)	31.05**
4.	Sense and Nonsense	29.42
5.	Tell It to Eben and Herb	26.56
6.	Your Money and You	26.25
7.	Inside City Hall	24.19
8.	Around Berks County	23.97
9.	Let's Go Shopping	20.86
10.	Oral History	20.60
11.	Dancing With Blaine	20.10
12.	What County Government Is All About	19.31
13.	Be My Guest	18.95
14.	Anna's Alley	18.75
15.	Your Social Security	18.0
16.	P.A.O.P. (Pennsylvania Association of Older Persons)	18.0
17.	A More Beautiful You	18.0
18.	Swap Shop	17.43
19.	Scrapbook	17.21
20.	Sound Off	16.5
21.	I'm Glad You Asked	16.11
22.	City Council Digest	15.62
23.	Poetry Corner	15.50
24.	Partners in Progress (Pennsylvania State University)	14.33
25.	Cooking for One	14.08
26.	Focus on Horizon	12.0
27.	Golden Memories	11.25
28.	Living Library	10.67
29.	Berks County News	10.27

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*Includes some numbers of high school students for whom this was a regular school class.

**This series had been scheduled as regular lectures at Horizon Center, and was minimally adapted for television.

Table 2

Program Segments In Order Of Mean Interaction Level Over The Year 1976

1.	Oral History	2.75
2.	Singalong	2.65
3.	Sound Off	2.63
4.	Tell It To Eben and Herb	2.59
5.	Is There a Generation Gap?	2.58
6.	Sense and Nonsense	2.53
7.	Scrapbook	2.48
8.	Partners in Progress (Pennsylvania State University)	2.42
9.	Berks County News	2.25
10.	Your Social Security	2.25
11.	Inside City Hall	2.25
12.	Poetry Corner	2.17
13.	Around Berks County	2.17
14.	What County Government is All About	2.14
15.	Living Library	2.13
15.	Cooking for One	2.13
17.	Adventures in Maturity (Red Cross)	2.10
18.	Be My Guest	2.07
19.	Your Money and You	2.06
20.	Swap Shop	2.0
21.	Dancing With Blaine	2.0
22.	A More Beautiful You	2.0
23.	Anna's Alley	2.0
24.	I'm Glad You Asked	1.7
25.	P.A.O.P. (Pennsylvania Association of Older Person)	1.67
26.	Let's Go Shopping	1.58
27.	Focus On Horizon	1.55
28.	City Council Digest	1.35
29.	Golden Memories	1.3

Table 3

Program Segments In Order Of Mean Phone Calls*Over The Year 1976

1.	Sound Off	5.38
2.	Sense and Nonsense	5.31
3.	Tell It To Eben and Herb	3.94
4.	Inside City Hall	3.68
5.	Singalong	3.38
6.	What County Government Is All About	3.0
7.	Partners in Progress (Pennsylvania State University)	2.85
8.	Is There a Generation Gap?	2.5
9.	Your Social Security	2.38
10.	Cooking for One	2.25
11.	Adventures in Maturity (Red Cross)	2.20
12.	Scrapbook	2.19
13.	Your Money and You	2.04
14.	Around Berks County	1.72
15.	Poetry Corner	1.67
16.	Be My Guest	1.57
17.	Berks County News	1.37
18.	A More Beautiful You	1.33
19.	P.A.O.P. (Pennsylvania Association of Older Persons)	1.0
20.	Anna's Alley	1.0
21.	Focus on Horizon	.8
22.	Let's Go Shopping	.62
23.	Oral History	.5
24.	Swap Shop	.4
25.	I'm Glad You Asked	.3
26.	Living Library	.25
27.	City Council Digest	.20
28.	Dancing With Blaine	.17
29.	Golden Memories	.13

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*These represent calls that actually went out on the system. Some people who called did not get on. The person answering the calls at the head end reported that it was sometimes as much as seven minutes from the time a call was answered until the person was recognized to speak on the system.

Table 4

Total Program Hours 1976

January	18.5
February	31.00
March	23.75
April	27.83
May	31.39
June	24.14
July	24.05
August	24.89
September	38.91
October	44.00
November	40.00
December	44.00
Total Program Hours 1976	372.46

Total Duration Transmission Problems, 1976 = 18.75 hours**

Total Duration Sound Problems, 1976 = 27.75 hours**

Percent of Transmission Problems over year = 5%

Percent of Sound Problems over year = 7%

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* Until September 1976, programming had run between an hour and ninety minutes a day. On September 27, programming became exactly two hours a day as it was carried from 10 to 12 noon on Channel 3 to all cable subscribers. Earlier in September, programming expanded to two hours, in anticipation.

**The bulk of problems were logged in the first three months of operations.

Table 5

Attendance Frequency 1976

Days Attended	Individuals
40 or more	43
11 to 39	79
2 to 10	258
Only once	704
Kennedy	159
Hensler	112
Horizon	813
TOTAL: New Attenders	1084

APPENDIX C

Brief Characterizations of Interactive Formats

Chapter 3 provides more details on many of the series listed below. Here are brief characterizations of the first twenty on the attendance list (Appendix B, Table 1). All were once weekly: one hundred twenty-two attended eleven or more times; of this group, 43 attended forty times or more. It is this latter group, referred to as the "regulars," who made up half or more of every day's attendance in the NCCs; they were the hosts, presenters, and producers--who, more than anyone else, developed the how and the what of interactions. After this group was established, the average attendance at NCCs grew very slowly.

Did the small cadre of regulars constitute an elite group that, by its assured manners and clannishness, discouraged any but the hardiest souls from trying to gain admission? Perhaps, although they were cheerfully welcoming toward newcomers and encouraged them to come in, to participate, and to return. It is more likely that the "regulars" were a self-selected clan of gregarious, energetic people, many of whom were natural leaders and performers. For them going to an NCC became a welcome routine, as many of them attested.

1. Generation Gap (Is There a Generation Gap?) Asked by Reading's immediate ex-mayor, each session brought students from a local high school together with seniors to discuss controversial issues.

APPENDIX C
(cont'd.)

2. Singalong. A community sing, one hour each Friday.
3. Adventures in Maturity. Guest experts discussed health, hobbies, psychology, and many other topics from the point of view of the older adult.
4. Sense and Nonsense. A quiz program.
5. Tell It to Eben and Herb. A number of different formats were developed by the two men under this rubric, the most popular of which was an opinion poll.
6. Your Money and You. Guest experts discussed not only assistance programs to which seniors might be entitled, but also insurance, taxes, ways to save money and economical renovation.
7. Inside City Hall. Weekly half-hour sessions with the mayor or another of Reading's council members, with the council people participating from City Hall.
8. Around Berks County. An omnibus series, often with videotaped segments, to meet interesting people and visit picturesque or nostalgic places.
9. Let's Go Shopping. A shopper's guide to best buys at local stores.
10. Oral History. Seniors recollected Reading's past for high-school students.
11. Dancing With Blaine. A "how-to" class with Blaine D., one of the system's most active presenters and hosts.

APPENDIX C
(cont'd)

12. What County Government Is All About. The counterpart of 7. Inside City Hall. The County Commissioners, and other major county executives, conversed each week from the County Building.

13. Be My Guest. Interviews with well-known, interesting people.

14. Anna's Alley. A precursor of 13. Be My Guest, where local authorities and celebrities were interviewed.

15. Your Social Security. Executives of the local headquarters, from their offices, brought latest news and answered questions about the programs administered by the Social Security Administration.

16. P.A.O.P. (Pennsylvania Association of Older Persons). A review of news and legislative events affecting senior citizens.

17. A More Beautiful You. Personal grooming tips and advice.

18. Swap Shop. Barter what you don't want for something you do... or buy.

19. Scrapbook. A series of programs of personal selections: favorite poems, stories, collections, and reminiscences.

20. Sound Off. An opportunity to get it off your chest, from an NCC or home.

BCTV
Berks Community Television
A NON-PROFIT ORGANIZATION

APPENDIX D

Recommendations For Interactive Teleconferencing

In two years of daily interactive programming among three or more participating centers we have found that some agreed upon protocols are required to facilitate smooth interaction via split screens and normal (conversational) audio interrupt.

THE MONITOR regulates interaction by showing participants who has the floor, and whom they are speaking with. Other information such as phone numbers, maps, etc., also appear when asked for. The monitor should be placed directly in front of the participants with the main camera as close as possible to it so that when talking to someone at a distant point, the participants appear to be looking at one another.

THE CAMERA is the basic visual signal to the head end switcher that someone wishes to speak, or who it is that is beginning to speak. Put that person on the righthand side of a split, with a closeup matching in size the shot on the monitor. If no one wishes to speak, give a wider "reaction shot" which may be punched up as an indication of audience. A shot of three or four people coupled with a pan of the audience is often more effective as a reaction shot than a truly wide static shot showing knees and ankles and no facial expressions.

SOUND: With a potential of some 35 to 40 live microphones, sound should be very carefully set up ahead of time. In order for someone to interrupt with a pertinent comment or question, all mikes should be live at all times. However, participants should be reminded that private conversations will be picked up. ("Can he hear me? Is my mike on?") Where there are a great many participants, they should be reminded to identify themselves and their location when they begin to speak, so that the head end switcher can punch up the center, even if the camera person has not yet "found" them.

SET-UP

1. In order to balance the video from all centers, cameras and lights may have to be adjusted to allow for electronic variations. Please allow enough time for these adjustments.

2. Audio levels often must be readjusted from the normal in-house level. Each mike should be retested while your monitor is at a comfortable volume. Please leave your monitor turned up so that any feedback can be traced during set-up.

3. When there is time, a "warm-up" after technical set-up usually results in a smoother on-air program as people adjust to sound and video interrupt.

c/o Horizon Center, 40 N. 9th St., Reading, Pa. 19601, (215) 374-3065

Hosting at Your Neighborhood Communication Center

Every center should have a host for the day who insures smooth running of the day's cablecast, easy transitions from segment to segment and fair distribution of interaction. Because the host is familiar with procedures on Berks Community Television (BCTV), he or she can help presenters in many ways:

1. If a presenter is more comfortable being introduced, the host can do the introductions and help guide the opening sweep.
2. If a presenter has trouble identifying a center, the host should help by short identification.
3. If there are technical difficulties in your center, please explain what is happening. If you can't hear another center, please say so; if a graphic is unclear, say so or read it for the others.
4. When your center is punched up at the end of a program, remember to thank the presenter and say goodbye for your center.
5. When a presenter asks if there are questions and there are none in your center, please say so.
6. Although a few moments of silence is not necessarily bad, the host should be available to jump in and direct a sweep, ask for questions, give the home-viewer phone number, or sum up if a presenter gets stuck or needs a break to check notes.
7. The host can insure that no one monopolizes the interaction by gracefully refocusing the discussion back to the presenter. "Let's see what the presenter has to say about your comments so far..."
8. Hosts may receive last minute changes in the day's scenario during the segment and should either pass these on to the presenter or use them at the appropriate time.
9. If a presenter does not notice cues (time, spots, or home viewer), the host should politely signal or break in.
10. Remember to say goodbye at the end of the day for your center during the closing sweep.

Recommendations for Presenting

There are some things which we feel will be helpful in making your presentation on Berks Community Television (BCTV) more effective and enjoyable.

1. Since it is necessary for us to set our microphone levels for your voice please plan to arrive at the center fifteen minutes before your scheduled program. This will give our crew time to properly set the audio portion of the system.

2. Speak close to (approximately 5 inches) and directly into the microphone. While testing the microphone, please use the same voice level that you will use for your presentation.

3. If you intend to stand or move during the program, please let us know a day in advance so that we will have a lavaliere microphone for you.

4. In order to show visual aids to the best advantage, it may be necessary for us to move our graphics camera from one location to another, set up and test special lighting, etc. If you plan to use any such aids (charts, props, photographs, etc.) please let us know at least a week ahead of time. If you plan to use slides we should have them at least two weeks in advance.

5. Since the home viewers and participants are accustomed to the interactive nature of the system we have found that presentations are more effective when done in relatively short segments (5-10 minutes) with time for questions and discussion interspersed throughout the program.

6. Remember that the participants are not limited to those in the center where you are located. Please regard the camera and monitor as additional participants and do not be disturbed by seeing the picture switch to the other two centers while you are speaking. The purpose of this is to give you an opportunity to see the participants at the other locations. When a participant at another center interacts with you, you will be able to see each other simultaneously on a split screen with yourself on the left half.

7. There are several ways in which questions may be posed and comments made. For instance, when a home viewer calls, you will hear their voice but will not see them. The crew will hold up a sign indicating that a home viewer is waiting to speak.

8. The only restriction on clothing is that white should not be worn. The reflected light from white clothing will affect the camera and make your face appear in shadow.

Please let us know how you enjoyed your experience with BCTV and if our system can be of service to you or your organization in the future.

TECHNICAL CONFIGURATION OF THE INTERACTIVE SYSTEM

by

Gary Schober

TECHNICAL CONFIGURATION OF THE INTERACTIVE SYSTEM

Introduction

The technical configuration of the Reading interactive cable system was based on three neighborhood communication centers (NCCs) which were equipped to transmit and receive audio and video signals to and from the head-end control points, as well as from a fourth remote location. A typical inventory of NCC equipment consisted of the following:

1. Audio Transmitting and Receiving Equipment
2. Cameras
3. Lens Complement
4. Camera Mounting Assemblies
5. Switcher and Synchronizing Equipment
6. Monitor and TV Receiving Equipment
7. RF Receiving and Transmitting Equipment.

This report includes a description of the NCC equipment and the process by which it was tested, adapted, and deployed. Some alternative strategies for technical replication of the interactive system are also proposed.

Orientation

Each NCC might be thought of as a separate "system" within the total system. This perspective allows us to examine technical difficulties locally in the context of the head end and its operation in concert with the downstream signal(s). It is recommended that the reader review the interim technical report in order to appreciate the genesis of hardware selection, installation, implementation, and modification. This report focuses on use of the hardware and the problems encountered. It is worthwhile to note that the magnitude of the electronic gadgetry that is frequently used to eliminate difficulties can be intimidating. In this project, budgetary limitations prevented this luxury; instead, simple cost effective cures were implemented for basic problems.

Viewfinder Cameras

Each NCC was equipped with two GBC CTC-5000 viewfinder cameras. One was used as a floor camera while the second served either as a "title camera" or backup shooting unit. Although the usable light sensitivity for this camera was claimed to be 1 foot candle, good picture contrast, depth of field, and evenness of lighting required supplemental lighting. A combination of "soft" and quartz lights reflected and diffused from the ceilings provided sufficient light levels to operate lenses at f 2.5. As much as 4 kw of auxiliary lamps were used to fill a room as large as Erdman Hall at Horizon Center. Also, at times the light levels were excessive, causing the automatic light control (ALC) in the cameras to work very hard to keep the camera output within one volt. All this underscored the importance of a wide range ALC in the camera. It should be noted that video signals were not "ridden" at any point in the modulation-demodulation process but clamped at one volt in the camera before modulation and maintained at this level by the ALC circuit of the cameras.

This efficiency is offset by the inherent disadvantages of "sync stretch" or "compression" when extreme light levels are encountered. "Sync stretch," caused by video level being too low, results in poor signal-to-noise ratio. (The picture is noisy because luminence information is reduced while sync information is excessive relative to the 1-volt composite signal.) At the other extreme, excessive video causes a proportional reduction in synchronizing signal amplitude providing jitter on the monitor. Careful attention should be paid to this point by establishing "benchmarks" or parameters of light levels and lens settings at each center.

In an attempt to resolve these difficulties, a series of experiments was conducted with solid state pick-up tubes to investigate feasibility of incorporation within the project. The results of the experiments were insufficiently conclusive, and light levels adequate for using vidicons were obtained with supplementary lighting. For example, it was hoped that greater depth-of-field might be achieved by use of a Tivicon tube; however, a neutral-density filter was required in order to maintain equal gray scale performance. This negated any light gain and dictated the same iris setting as for the vidicons. (Most solid state pick-up tubes tend to be disproportionately sensitive away from visible light.) No attempt was made during the experiments to alter thc "gamma" correction circuits within the cameras to compensate for this stigma.

The portable cameras used in conjunction with the 1/2" Sony Rover VTR's would be enhanced considerably by using solid-state tubes since available outdoor light levels far exceed studio (NCC) environments even with the inclusion of a neutral density filter. This change would be recommended since, additionally, solid state (diode) tubes have no "stiction" or lag (also referred to as "comet tail" caused by fast picture motion of bright highlights). Generally, the NCCs were too bright and intimidating for the seniors when light levels above 35 foot candles were used.

Viewfinder Specifications: There were two GBC CTC-5000 cameras with companion viewfinder module in each NCC location. The cameras were chosen because they met the following requirements:

a) Resolution: 650 lines at 8.5 MHz bandwidth
Low noise: 50db signal-to-noise ratio with FET video input

b) Sensitivity: Usable picture at 1 footcandle with 10 steps of gray scale (and, as a practical matter, about 5 foot candles)

c) Automatic light control 5000:1

d) Sync: 2:1 industrial.

The principal reasons for choosing the CTC-5000 cameras were simplicity of operation, cost, and ability to drive externally in a "systems configuration." Electrically, these cameras are compatible with the Sony SEG-1 series Special Effects/Sync Generator; however, the interconnecting cable must be modified for pin compatibility. No attempt was made to use intercom or tally lights on the cameras since the Sony SEG-1 does not have these features.

Perhaps the most annoying problem encountered with the cameras was a recurring and intermittent hum caused by an incorrectly wired viewfinder. Regrettably, the units purchased for the project were of early manufacture; as a result, it was impossible to correct this problem easily. The problem would be eliminated by using units of later manufacture which are wired differently. This potential problem can be easily spotted by checking to see if the first and last pins of the viewfinder interconnection card are "looped" together in the viewfinder. The severity of this intermittent problem tends to be proportional to target voltage; therefore it is most pronounced when the camera is operating with a well-used vidicon. The only complaints regarding the cameras involves the manufacturer's choice of interconnecting cables. The interconnecting plugs are very fragile and no strain relief is provided; also, the cable itself is inadequately shielded and therefore subject to RF interference.

Lens Complement: Each center normally had a viewfinder camera operating in studio fashion while the second camera was used for titling purposes. The studio camera was equipped with a rather fast f 1.8 zoom lens having a 10:1 zoom feature. The only criticism that might be raised is in regard to its size, being rather large and perhaps intimidating in comparison to the size of the viewfinder camera. When considering future systems, a more modest lens might be in order if the shooting environment were the same. A 4:1 (25 - 100 mm) lens is probably adequate for most NCC shooting situations since the layout of the audience is quite regular. The paramount consideration in any choice of lens is simplicity of operation. A push-turn zoom-focus control rod would be preferable to the bell crank rear control assembly which is more difficult for an untrained operator to use.

Camera Mounting Assembly: Each studio viewfinder camera was mounted on a medium-weight tripod and dolly assembly. The dolly assembly was seldom used for shooting; but in two of the three centers, where the equipment had to be rolled away after each day's use, the dollies provided the necessary mobility. The zoom lenses that were affixed to the viewfinder cameras caused the camera lens assembly to be heavy and not optimally balanced for a spring-loaded panhead. If such a large lens were again used, a floating rather than spring-loaded head would be a wiser choice.

Audio

The audio signal fed upstream to the head end was derived from a number of microphones and/or a VTR. This signal, in the form of an FM carrier, was conveyed via a television modulator operating on channel 3, 5, or 6 (60 - 88 MHz). Between 2 and 6 microphones were used in a typical interaction and the specific microphone differed with the kind of activity. Usually, guest lecturers and the like used lapel microphones (A 34L Shure) while an assortment of RE 11 or EV 635 hand-held microphones were passed among the speakers in group interaction.

Various experiments were conducted with different kinds of microphones to achieve maximum performance of each center. Sound pressure measurements revealed the volume differential between the "talker and listener" to be only about 12db above ambient noise.

When room noise is high, this limitation provides less than adequate volume, especially for senior citizens whose hearing may be impaired.

Attempts to achieve greater "talker-to-listener" ratios were made with the following results. Equalization at each center was provided. All frequencies of interest were "flattened" to minimize loss of intelligence. Due to the dual modulation-demodulation system, frequencies below 100 cycles and above 8 KHz were unimportant. No other improvements in volume could be gotten by treating all frequencies equally. However, some increase in volume (actually a decrease in feedback) was achieved (+3db) by tailoring the frequency response to the acoustical environment. This unequalized response was an addition of two factors: (a) room balance and (b) high and low frequency emphasis (actually mid-frequency de-emphasis).

Room "bounce" or "deadness" was offset to improve intelligibility by manipulation of a multiple octave filter/booster. This procedure was a trial and error method using a Shure Feedback Stabilizer which has notch or boost provision for frequencies from 63 Hz to 12 KHz (± 6db in 12 octaves). This unequalized approach increased usable volume without apparent loss of intelligibility to seniors.

(It has been observed in many tests of senior citizens' hearing that extreme low and high frequencies are attenuated due to hardening of the eardrum, causing loss of sound "brilliance" or "presence" and thereby reducing intelligibility. The project's subjective experiments on optimizing sound for elderly people were made in the absence of a clinical environment.)

In a static microphone situation with no mike handling, acceptable volume levels are achievable when acoustical response is nulled by the feedback stabilizer. Unfortunately, most interactions are rather dynamic in nature causing the carefully prepared static conditions to change. Each microphone, when understood as an acoustical receptor whose pickup area is a function of directivity and sensitivity, is a potential source of both intelligence and feedback. Assuming equal input gain at the mixer, every microphone added to the system will contribute noise and greater potential for feedback. Reducing the potential for feedback is accomplished acoustically by increasing the distance between microphone(s) and speaker(s) through directivity. The RE 11 microphones have excellent front-to-back ratios for fine directivity and sensitivity, thus increasing overall system performance by several decibels when used properly. They became the instrument of choice in dealing with this quite difficult problem of adequate volume level.

Operation of the mixer at the head end involved a great deal more magic than might be required at any center since the head end was receiving as many as thirty different microphone signals which were subject to at least as much variation as the levels at each center. These received signals were mixed and re-transmitted back down the cable (downstream) to all centers and viewers. When the peak volume from any one center exceeded the marginal threshold of feedback safety, complete collapse of the audio delivery often occurred because each member of the technical staff would instinctively turn down the NCC's mixer volume levels to quiet the "howl." This naturally caused a momentary loss of audio, but worse, an irreconcilable difference in levels between centers was created when each NCC made adjustments that threw off the adjustments just made by the others, much like a cat chasing its own tail.

A straightforward solution to this problem was to design and install a peak detector circuit to each input preamplifier on the head-end mixer with a visual indicator flagging the offending center. This allowed the head-end switcher to take corrective action and allowed operation of each center without having to ride levels locally; but this overall audio control was centrally performed at the head end only after initial set up.

Still greater improvements in volume and intelligibility were obtained by use of a Dugan mixing amplifier loaned to the project by Bell Laboratories. This eight-channel mixer (now sold exclusively by Altec as model 1028A) operates rather uniquely by a principle referred to as "gated gain reduction" on each input channel. Essentially, the maximum output from the mixer can never exceed 100% because each input preamplifier's volume is monitored by a peak comparator whose job is to feed an attenuation voltage proportional to excess output voltage back to the output amplifier stage regulating overall gain of the mixer. This process is done for each input preamp, and the attenuation voltages are fed into a summing amplifier with a pre-set threshold. This is not simply AGC (automatic gain control) but rather a process whereby if two inputs are active on the mixer, each representing potentially 100% output, both signals are attenuated so that the sum of their output will never exceed 100%. What this means is that excessive audio output from the mixing amplifier, the principal cause of feedback, is eliminated. Since each channel has a threshold to cross before it becomes active to the mixer, large numbers of microphones (up to 40 inputs by cascading mixers) can be utilized without additive noise. Full spontaneity is achieved with automatic-peak-gain eliminating the necessity to "ride levels." In the NCC environment, the mean sound level was doubled (+6db) to the point just before feedback and automatically controlled to maximize system performance.

The speaker amplifier and speaker placement in each center became critical in order to achieve good sound balance and fill each room equally, thus avoiding any "hot spots" or excessively loud areas that could cause feedback. Best results were obtained from general purpose high-fidelity speakers (woofer, tweeter, and midrange units) placed in front to face participants. This arrangement maintained even sound dispersion.

The ultimate solution to regenerative feedback may be in circuitry "electrically configured as acoustical feedback." This process would entail a power amplifier and phase-splitting network with two outputs. The input to this network is demodulated as received audio at the remote location. The "in-phase" output is then fed to the power amplifier for normal speaker amplification. The "out-of-phase" output is fed to a spare input of the microphone mixing amplifier. The various microphones (whose in-phase ouputs are feeding the head end from this signal at each location) have part of the received audio signal introduced into each remote location's microphone mixer but at a phase 180 degrees away from acoustical feedback, i.e., sound energy is radiated from the local speakers, received by local microphones, and presented to the microphone mixer. The interesting aspect of this configuration is that rather than providing a fixed increase in the threshold of feedback, the threshold margin dynamically moves with volume. This system would present difficulties due to audio delays if large distances were encountered between locations.

Switching and Synchronizing Equipment

Each location participating in the video interaction was given the capacity to mix at least three cameras. This composite mix from each participating location was fed upstream to the head end for selection and/or mixing with a similar but expanded mixer/fader effects generator. In order for the remotely-generated signals to be received at the head end with a phase such that no loss in synchronization would occur between switches (vertical interval switching), and to provide split screens, each SEG-1A and the expanded head-end SEG-1A were modified with a circuit to provide a range of several horizontal lines of genlocking ability . A 9" receiver/monitor tuned to channel 8 from Philadelphia provided a composite and electrically-identical synchronizing signal for each SEG-1A. Differences in signal velocity within the cable and roundtrip distances through the cable were compensated for by these extended range genlocking circuits.

This facility provided the means to operate each location as a studio but with a video phase of identical character fed upstream to the head end for smooth switches, splits, and inserts. The nominal timing differences between centers were from 1/3 to more than 2 horizontal lines (20 to 155 microseconds).

The head-end switcher was additionally modified to accept five rather than four video inputs (one being a genlock source), since in addition to the three participating centers, various local government and agency offices participated in the programming as remote feeds to the head end. The Sony SEG-1A chosen for these tasks was designed and built by Shintron for Sony Corporation. It was of very poor design and the manufacturers would offer no help or technical counsel to the project regarding such difficulties as overheating, buss crosstalk, and signal level drifting. At the beginning of the project, no other switcher/fader effects unit was available for under $2500. This is no longer true, and other products can be reviewed.

Monitor and TV Receiving Equipment

The signals received at the head end from participating centers or remote locations were previewed on an 11" Sony television and then fed to an input on the head-end SEG-1A. Preview output of the SEG-1A was fed to an additional 11" monitor/receiver as was the line output delivered to the system downstream modulator. At each NCC, or remote location, the downstream received signals are displayed on 23" Setchell-Carlson monitor/receivers. The audio output from each receiver is fed to a power amplifier driving two high fidelity speakers placed at 45 degree angles to the center of the room in front of the participating audience. These speaker/amplifier and auxiliary speakers provide the necessary fullness of sound and evenness of distribution to optimize re-transmitted downstream audio. When exceptionally large audiences are encountered, the Setchell-Carlson built-in audio amplifier speaker arrangements can also be used.

Three 5" monitors at each NCC provided full representation of both cameras (floor and title) as well as the composite output feeding (the television modulator). An auxiliary 9" receiver monitor is used for the local video tape recorder and portapak playbacks.

All daily programs were recorded at the head end on 3/4" cassette (Sony VO 1800) for future study. These programs were later edited, cataloged and duplicated for distribution. All field recordings were made on 1/2" (Sony) Portapack VTRs and played back on the system through (Sony) AV 3650 decks; they were later transferred to 3/4" format. No serious difficulties were encountered with any phase of recording or editing this material, and the equipment was managed well by the staff.

RF Receiving and Transmitting Equipment

The RF distribution of NCC signals in the upstream mode (from each center) is delivered on channels in the VHF low band via Blonder-Tongue model VT 1490 television modulators. Since signals from participating NCCs travel some distance before reaching the first upstream supertrunk feeders, the modulators are adjusted for 50-56db visual carrier signal level. This high level distribution is somewhat advantageous when cable lengths such as at the Hensler complex are encountered (1 1/2 miles before first upstream amplifier). The reader should note typical CATV distribution requires amplification each 1,500 feet with signal levels generally not exceeding 30 to 35db.

Early in the project, the RF distribution of downstream signals represented a rather unique situation compared to other broadband CATV systems. The ATC-Berks CATV system has at least 25 channels of programming available for downstream distribution at any time but only 12 downstream channels capable of being transmitted through the Kaiser single-ended trunk amplifiers. This contrasts with most cable systems in this country since downstream capacity using push-pull trunk amplifiers are capable of at least 20 channels and therefore create a situation which may be representative of future cablecasting where, indeed, the number of programs exceed technical capability. Also, project replicability is more credibly represented since the system was both technically and logistically compromised to accommodate the project's experimentation.

At this time the ATC-Berks system is being retrofitted with state-of-the-art push-pull amplifiers and an associated increase in bandwidth is anticipated. Most significant is the understanding that the project operated under constraints unique to today's typical CATV systems but anticipated to be commonplace in the 1980's.

Audio Visual Game Experiment

During the course of implementation, two variations of home-like TV games were connected to the system for demonstration purposes. Player participants were located at either the head end and a center, or at two centers, with a graphic display of the game board on the TV. Control of the game's bat position was facilitated by a player control box with a position knob. A narrowband frequency shift keying (FSK) signal was generated at one player-participant's location and mixed with the program audio and fed to the head end or other remote location. This control signal was demodulated from the television FM sound carrier and fed to a filter and limiter amplifier stage tuned to the FSK signal. The output of the limiter was fed to a wide range PLL detector whose output was amplified and presented as an analogue voltage waveform to the game circuit's paddle input. (This provided remote control of bat or paddle position anywhere on the screen.)

Technically, this game system was fairly successful in that it provided reasonable noise immunity and excellent response to the players' controls. The experiment was interesting in that it enables one to consider these kinds of digital-analogue controls for other things such as cameras and visual effects, as well as graphic data for computer-assisted instruction (CAI) and retrieval.

Remote Head-End Switching Experiment

During the course of experimentation, a remote switching system was designed and installed to allow demonstration of the feasibility of controlling the head-end switcher from any of the NCC centers. No attempt was made to finalize this design since its use was not extended beyond demonstration and no programming was structured for its implementation; however, a simple description of the design, components, and modifications may be useful.

Since each center is connected by private telephone intercom to the head end, transmission of Touchtone(R) in signals provided an extension of A, B, and Preview mixing busses on the head-end switcher/fader, special-effects (SEG-1A). The Sony SEG-1A is not supplied from the factory with connections to be remotely controlled. All switched functions within the SEG-1A are internal TTL voltage levels which were bridged and brought to a connector at the rear of the SEG-1A. An interconnecting cable was prepared to mate with the new remote control contacts and a Touchtone(R) logic decoding circuit. Upon receipt of the proper dual-tone pair, the grounding signal duplicated the button functions of the SEG-1A. In the situation where split-screens or corner inserts were required these effects were present in advance and were "taken" by remote execution of the "effects" button.

A natural extension of this implementation would be to incorporate this signaling technique at all locations to provide the means for on-demand video. Further, these signals could be easily encoded sub-audibly and inserted in the normal program audio channels to eliminate connection through private telephone intercom and facilitate automatic monitoring for data collection and usage.

Summary and Conclusions

Technical hindsight is a gift of wisdom provoked by compromise of objectives and a galaxy of new alternatives. In the Reading project this is only partially true due to the rapid growth of video technology and RF distribution and more largely true by changes in programming. The concept of signal flow in the experimental system may be pictured as a "studio-to-studio" information exchange; either between center and head end or center through head end to associate centers. This concept is fundamental to the Reading interactive system and presents a departure from conventional one way TV or "narrowcasting." The essential technical ingredients to this end are a modified switcher-fader and a special effects generator installed at each NCC to synchronize timing of all video signals. Spontaneous audio interaction is achieved by mixing all centers at the head end and feeding the mixed audio downstream as an "all-hear-all" dimension. These audio and video downstream signals are delivered to three kinds of viewers: to associate NCC locations; private channel, converter-equipped, home viewers; and all cable subscribers.

The RF distribution used in the ATC Berks CATV system is somewhat antiquated by today's standards and used a "dual cable" for delivery of signals bi-directionally, as opposed to two-way single cable amplifiers, split into dual-bands for up and downstream signals.

Objectives of the Technical Design

The fundamental criteria used in the technical design were replicability, simplicity, and modesty all without forcing the research to fit technical limitations.

Each NCC was equipped with two viewfinder cameras requiring three simple adjustments for day-to-day setup. The cameras had built in automatic light control (ALC) and preset gain and set-up levels eliminating necessity for "green-line monitoring." Early in the system's set up, it was learned that seniors could not operate these units with the required dexterity despite the simplistic technical approach. Therefore, first on this author's list of wishes might be an auto-camera likened to the eye, requiring no adjustment.

Between these two extremes there are new camera devices requiring only basic optics with extraordinary sensitivity and wide dynamic range of operation under varying light conditions. Picturephone(R) Mod 2 and more recently Picturephone Meeting Service(R) cameras represent a greater degree of simplicity with their fixed lenses and silicon diode pickup tubes. Additionally, charge-coupled device pickup tubes offer extraordinary resolution with super-linear output quite suitable for digital implementation. Although these devices are at this time more expensive than Vidicon cameras such as used in the Reading project, the performance advantages and simplicity of operation would make them natural candidates for consideration in future interactive systems.

As discussed in the interim report on this project, the double modulation-demodulation process used to transport the interactive video signals caused picture degradation in excess of one way programming. There is, to date, no evidence to indicate that this signal degradation compromised performance or participation in programming. On the contrary, a suspicion may surface that the experimental channel created its own identity due to production simplicity with its stark reproduction quality. One may further hypothesize that consideration for such elements as color, "production snap," stereo sound, or professional "talent" may detract from its impact in hopeless attempts to compete with network television.

Each NCC was originally envisioned to be a two-camera setup staged in the typical crossfire viewing angles. This concept was abandoned early in the set-up phase of the project. The second camera using a fixed focal length lens was modified and installed as a vertical titling camera for inserts and visual graphics. This obviated the need for a second viewfinder which was used as a backup component.

With some certainty it may be said that an interactive system of this kind using current color camera technology would be prohibitively expensive based on the absolute need for a trained technician at each center to maintain balance and faithful color imagery.

The most difficult aspect of the technical system was also one of the least anticipated. Inadequate audio levels in the system were caused by two factors: high potential for feedback and hearing impairments of some seniors. Audio difficulties required the largest concentration of technical attention throughout the project to optimize performance. Due to varying acoustics, audience sizes, and non-professional system operators good audio delivery was seldom achieved. To circumvent these difficulties, a larger portion of capital hardware monies should have been directed toward special audio mixers (such as the now available Dugan amp), public address feedback stabilizers using frequency shift and delay line techniques, and greater attention to acoustic details.

Since the Reading experiment was a test of programming concepts using existing "off-the-shelf" technology no budget foundation or thesis for technical demonstration was required or implemented. Beyond the scope of the project, micro-experiments specifically suited to optimize audio performance within the dynamics of interactive television, could be made. Likewise, automatic camera tracking systems referred to as ocular driven devices would ideally suit teleconferencing and interactive television. Voice-switched and remote-switched pictures discussed earlier may provide an additional magnitude of program spontaneity to interactive television, elininating the head-end switcher; and optics would also be desirable for increasing the naturalness of interactions as well as allowing for greater eye contact and user-control.

Alternate forms of communications not implemented in the project such as data from a central repository, computer-assisted instruction, or digital graphics, may be transmitted through the same broadband RF system in which television pictures are delivered. These data may be catalytic to interactive television or supplement information flow. The primitive experiment mentioned earlier (telegames) offered encouragement to this pursuit of non-verbal/visual interaction. Although the man-to-man...man-to-machine model of communication is separable, more effective interactive communication may be achieved through a mixture of these media. Unfortunately, to date, research into these kinds of systems has overcompartmentalized evaluation perhaps beyond the limits of effectiveness.

INTERACTIVE TELECOMMUNICATIONS AND LOCAL COMMUNITY PROCESSES

by

Mitchell L. Moss

INTERACTIVE TELECOMMUNICATIONS AND LOCAL COMMUNITY PROCESSES

Introduction

Cable television has been characterized as a technology in search of a mission.[1] A framework through which consumers and producers of public services can be brought together to use interactive cable television to serve their needs is discussed in this report. The participation of senior citizens and service delivery organizations was the keystone of the Reading cable television experiment. Their direct participation in the experiment has had pervasive and powerful effects on the nature of the overall project. It has required modific[illegible]ons in the technical configuration of the system and in the design of research methods during the course of the experiment. Further, the involvement of user groups has provided the basis for developing local support so that the experimental two-way system could be converted into a community-based cable television system. This report analyzes the effects of community participation on: (a) the development of the two-way programs, (b) the role of service delivery organizations, and (c) the continuation of the experimental two-way cable system.

The Development of Two-Way Programs

The development of programming did not depend on elaborate technology; it depended on the capacity of local citizens to formulate public uses of interactive cable television. Government agencies did not assume responsibility for the production of programs; rather, senior citizens acting as both consumers of public services and as the clientele of specific agencies, were responsible for organizing public service programming.

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[1] Walter S. Baer, *Cable Television in the United States - Revolution or Evolution?* The Rand Corporation, P-5153, Santa Monica, February 1974.

This contrasts dramatically with the conventional approach to the development of broadband communications which implicitly assumes that public agencies can, or should, be the mechanism for generating public uses of cable television.[2] Yet, public sector agencies have little knowledge or understanding of how cable television can serve their goals. Even where a cable channel is designated for the use of government agencies, there is relatively little use of the channel for its intended purpose. Public bureaucracies, faced with the problems of meeting federal requirements, managing budget cutbacks, and putting out their own day-to-day brush fires, simply do not perceive cable television as a potential vehicle for fulfilling their needs. Consequently, there is little willingness to invest scarce organizational resources in a new technology which seems far removed from the daily rigors of administrative life.

Further, state and local governments often lack the necessary information and incentives for the adoption of new technological innovations. Unlike the private sector, where the marketplace rewards improvements in productivity which are achieved through the application of new technologies, the public sector is usually notable for the absence of such direct incentives. The lack of incentives is further compounded by the existence of distinctive barriers to the adoption of technological innovations in public bureaucracies; the political environment of public agencies is characterized by accountability to a variety of external groups which limits the use of new technologies.[3]

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[2] Peg Kay, Social Services and Cable TV, Washington, D.C., U.S. Government Printing Office, 1976. Also see, Robert K. Yin, Cable Television: Applications for Municipal Services, The Rand Corporation, R-1140-NSF, Santa Monica, May 1973.

In the Reading project, the obstacles to technological innovation were overcome through a rearrangement of the traditional pattern of responsibility for that innovation. Through their involvement in the planning and operation of the two-way cable system, senior citizens were able to articulate their preferences for specific types of cable programming directly to local government agencies. Public sector organizations, which might have had no incentive to use the cable system independently, were clearly in a different position when they were responding to a request by an organized clientele.

The results of this process have been impressive. A diversity of public and quasi-public organizations have used the interactive system to communicate with senior citizens. More than seventy agencies participated in the programming. Twenty organizations were regular users of the two-way cable TV system and fifty appeared on an occasional basis. Educational institutions accounted for 15% of such programming, and the social-service delivery agencies were responsible for 49% of the programs.

In the Reading project, the consumers of public services were both the subjects of the experiment and participants in defining the content of the programs. The active role of the elderly participants in the project required trade-offs between the values of quasi-experimental research and the interests of senior citizens. Consequently, it was necessary to adopt an open-ended evaluative framework which would allow modifications in both the configuration of the two-way cable system and the content of the programs during the course of the project. The initial research proposal called for a rigorous evaluation of the impact of the interactive programs on the use of specific social services, such as Medicaid and Food Stamps. However, not all senior citizens agreed on the value of such social welfare services. Many middle-class senior citizens were reluctant to have what came to be regarded as "their" cable system used on behalf of such programs for the poor.

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[3] Robert K. Yin, Karen A. Heald, Mary E. Bogel, Tinkering with the System: Technological Innovations in State and Local Government, Lexington Books, Lexington, Mass., 1977; and David J. Roessner, "Incentives to Innovate in Public and Private Organizations," Administration and Society, Vol. 9, No. 3: November, 1977.

Like most population groups, senior citizens display considerable heterogeneity with regard to social class, education, income, and preference for public goods and services.[4] In order to respond to the diversity of senior citizens' preferences, the interactive cable system could not be oriented solely towards social welfare programs but rather had to encompass a broad array of services for the elderly. Numerous social services were provided over the two-way cable system and the programming covered a far broader range of services--from exercise sessions and opinion polls on current events to discussions of sex, aging, and other personal matters--than had been proposed for experimental purposes. What researchers had assumed to be the needs of the elderly did not fully correspond to what the participants actually wanted in terms of cable programs that corresponded to their own preferences. To assure that the system would answer those needs and preferences, a flexible framework for programming was adopted, in which senior citizens could develop their own cable television programs to serve their interests rather than only fulfill the requirements of research design.

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[4] For a detailed discussion of the socio-economic characteristics of the senior citizens, see Volume II, "Impact of a Neighborhood Communication Center System on the Elderly in Reading, Pennsylvania."

A fundamental change in the number of senior citizen participants occurred when a decision was made to carry the interactive programs over a regular cable channel so that all 35,000 local cable subscribers could view the programs and participate by telephone. This decision was based on findings from a survey which indicated that more than 40% of the home viewers watched the experimental programming regularly and hence that there was a large potential market for the interactive programs. This was a considerable departure from the original interactive cable system which was comprised of three neighborhood communication centers (NCCs), a remote origination site, and 117 home viewers who received the programs in their homes over a special cable channel via a home converter.

The value of altering the overall nature of the experiment became an issue of debate among the implementation and research teams. There was a concern that the interactive character of the system would be lost and that the programs would become less specifically oriented toward the elderly. Neither of these changes occurred. In fact, the expansion of the system made the two-way programs accessible to a far larger number of senior participants who could participate by telephone and who often visited the NCCs. Further, it provided the basis for building widespread community knowledge of and support for the interactive system in hope that the project would be fully taken over by the local community at the end of the experimental phase.

This major alteration in the design of the system was made based on the interest exhibited by the group of senior citizens who viewed the programs from their homes. And this alteration, which enabled a far greater number of senior citizens to become involved in the project, laid the groundwork for more widespread community support of the system. Hence, the effects of the experimental system as initially designed led to a change which, in itself, had substantial effects on the experimental system.

The Role of Service Delivery Organizations

During the planning phase of the experiment, New York University was responsible for soliciting the participation of both senior citizens and service delivery organizations. At the outset, the city government and four public agencies agreed to participate in the project. Two agencies provided space for the neighborhood communication centers. The only requirement for participation was the willingness of an organization involved in serving senior citizens to provide the time of its representatives for the two-way programming.

By relying on senior citizens to produce cable programs, public agencies were able to use the cable system on an incremental basis, without investing substantial amounts of staff time and resources in planning and development activities. Programs were initiated on a trial basis and if the senior citizens and participating agency were satisfied, then a regular series of programs was conducted. The typical pattern of organizational innovation in which an entire agency is required to adopt a new process or product *in toto* was not characteristic of the Reading cable project. The open-ended nature of the Reading cable system and the fact that it depended not upon one agency but upon an aggregation of public agencies created in effect a "one-stop service center."

Numerous local organizations used the two-way cable system over the course of the project and became familiar with both cable television and the needs of the elderly. Public and quasi-public agencies not primarily concerned with the aged participated in the programs on an ad hoc basis when seniors sought specific information and services from them. Because there was no single governmental unit designated to develop cable programs, many public and quasi-public agencies developed different uses of the two-way cable system to achieve their goals. Although no one agency required an extensive amount of program time, the combination of organizational participants generated substantial use of the interactive cable system. Thus, it was not necessary for any one entity to commit a large portion of its activities to the cable system. As a result, the traditional barriers to technological innovation at the local level did not arise in Reading.[5]

The impact of the interactive cable programming varied among the different types of public organizations. A structured questionnaire was administered to all of the organizations that used the system on a regular basis. Substantial differences were found in the goals that the programming served for elected versus appointed officials. Five out of eight (62.5%) of the elected officials reported that the major effect of the system was "receiving input" and "allowing interaction," whereas only three out of fourteen (21.4%) of the non-elected officials considered "receiving input" or "interaction" as a product of the cable system. The remaining appointed officials split about equally in identifying the primary effects as an

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[5] The Reading cable television experiment possessed some of the characteristics considered necessary for a successful demonstration of new technology. See Walter S. Baer, Leland L. Johnson, and Edward W. Merrow, "Government-Sponsored Demonstrations of New Technologies," Science, Vol. 196, 22 May 1977.

"additional medium," "providing publicity," "realizing the potential of interactive cable television," and "don't know."

Differences between elected and non-elected officials were also found in their response to a question concerning whether or not the organization's goals were achieved by two-way cable programming. More than 75% of the elected officials stated that their goals for the interactive cable programs were reached, while only 43% of the non-elected officials clearly felt that their goals were achieved. The latter group was not explicitly dissatisfied but rather found it "hard to say" whether or not their goals had been reached.

Such differences in the perceived functions that the experimental cable system served reflect the different roles of elected representatives and appointed bureaucrats. For the elected politicians, communication with constituents is a basic element of the job; the process of speaking through two-way television to citizens is, in itself, the product. It provides a means of "staying in touch" with voters and of demonstrating responsiveness to the constituency.

For the appointed official, the two-way cable programming was designed to provide information and make referrals to clients about specific social services. The interactive cable system functioned as a means of achieving increased service utilization by disseminating information and responding to specific inquiries about program requirements and regulations. The process of communication between client and official was more narrowly conceived and instrumental than the open-ended citizen-government interaction where the process of communicating was regarded as a valuable product in and of itself.

Further, state and federal social services for the elderly are characterized by a substantial body of administrative rules which limit the administrative discretion of public bureaucrats. The capacity of appointed officials to respond to individual problems of such programs is largely confined to explaining agency procedures and policies. Thus, there is relatively little flexibility in bureaucratic responses to citizen concerns. Unlike elected officials, whose authority stems from the individual citizen's vote and for whom the receipt of citizen input is a recognized and accepted aspect of the job, the authority of the social service official is based upon their presumed professional expertise, a knowledge which is acquired independent of their clientele. Professionals are socialized to perceive their training and skills as the source of their knowledge and power and are accountable to fellow bureaucrats, rather than to consumers.

The difference in the perceived value of the two-way cable system between the elected and appointed officials suggests that direct accountability to the electorate, as well as power to effect change, play important roles in the impact of two-way cable programming. Thus, if interactive cable television is to be used in the provision of social services, it is clear that attention must be given to the character of the relationship between the participating citizens and public officials, as well as to the nature of the service function itself.

Findings from the survey of organizational users indicated that public agencies used interactive telecommunications for a variety of reasons and to obtain a variety of benefits. Surprisingly, production efficiency in the provision of goods and services was only a part of the basis for organizational participation in the cable system. While certain agencies regarded the interactive cable system as an innovative means of providing outreach services which are otherwise conducted through staff visits to individuals and community centers within the urban area, the municipal and county governments viewed the cable as a mechanism for obtaining citizen feedback on public policies and programs. Other service agencies utilized the two-way programming to disseminate information to clientele who are traditionally hard to reach; but for some organizations, the system served as a tool for gaining exposure and enhancing their status in the community.

Willingness to respond to the specific demands of citizens rather than concern for achieving administrative economy and efficiency was clearly the critical factor in the Reading project. Two-thirds of the public officials surveyed stated that they participated in the cable programming because it served as a means either for "giving information" or "receiving input." Although there were certainly reductions in the administrative time and travel costs for officials who might otherwise have had to travel to dispersed locations in the community, no mention was made of such savings. Therefore, representatives of public organizations perceived the interactive cable TV system as a means of achieving goals more directly related to client involvement than to service delivery *per se*. This highlights the importance of the interactive capacity of cable television and suggests that emphasis be placed on the role of consumers rather than on the specific service delivery functions to facilitate the development of future applications of two-way cable television.

The Continuation of the Experimental System

The continuation of the two-way cable TV system at the end of the experimental phase reflects, most vividly, the importance of allowing system users to play a major role in shaping and defining public service applications of cable television. Support for the system was generated largely by the fund-raising efforts of local citizens, grants from federal and state agencies, and the enthusiastic cooperation of the local cable television company. Clearly, the Reading system was perceived as a useful and worthwhile mechanism by a sufficient number of community members to ensure its continuation. Furthermore, sufficient skill had been developed on the local level to enable community members to expand the system and develop further uses of it.

The active involvement of citizens and organizations created the basis for local support so that the interactive system could be turned over to the community at the end of the experimental phase. Although this was not a requirement of the sponsoring agency, the development of a community-supported two-way cable system had been a project objective from the outset. The director of implementation worked closely with senior citizens and representatives of public and private groups to create a community organization for continuing the two-way system. In 1976 a local non-profit corporation, Berks Community Television (BCTV), was established to plan for and operate the two-way system at the termination of the experimental phase.

BCTV is governed by a board of directors consisting of representatives from the city and county governments, senior citizens organizations, educational institutions, private firms, and the local cable television company. Its initial planning activities focused on the formulation of a fund-raising strategy and the solicitation of funds from local businesses and foundations to maintain the system's operation. Although BCTV had been granted approval by the commonwealth of Pennsylvania for partial tax-credit for corporate donors, the process of raising funds proved far more difficult than had been anticipated.

Potential contributors rarely considered two-way cable television as a community endeavor which was comparable with traditional local charities, such as the United Way or a building fund. Many of the business people were not familiar with BCTV since they worked during the daytime hours when the interactive programs were conducted. Other groups associated cable television with the commercial medium of broadcast television and had to be convinced that BCTV was both needy and deserving.

By February 1977, which was the last month of experimentally-sponsored programming, sufficient funds had been raised locally to cover only one additional month of programming. Consequently, an intensive fund-raising drive was initiated in which senior citizens became more directly involved in the fund-raising process. A campaign entitled "Save Our System" was launched on the cable channel; seniors were asked to contact their friends and relatives and to write letters to public officials urging them to support BCTV. Senior citizens sponsored cake sales and luncheons, donated their own money, and encouraged others to contribute to BCTV.

On March 1, 1977, NYU's funding for the experimental phase ended and BCTV assumed responsibility for operating the two-way cable system. Shortly thereafter, a grant from the Public Committee for the Humanities in Pennsylvania was received which provided critical support for programming activities. By June 30, 1977 BCTV had received more than $60,000 in local donations. More than 230 individuals and 20 businesses as well as senior citizens organizations, community groups, and local foundations donated funds to BCTV. Private business contributed a total of $26,000, individuals gave a total of $4,800, and local foundations contributed $11,000. BCTV applied to the Administration on Aging of the U.S. Department of Health, Education and Welfare for funds to support social service programs for the elderly but their grant application was rejected. A grant from the National Science Foundation to New York University to disseminate research activities did, however, provide funds to support BCTV operations for four months.

A major breakthrough in BCTV's financing arrangements occurred when the Berks County Area Agency on Aging sponsored a series of interactive cable programs on pre-retirement counseling in which BCTV was paid a fee of $500.00 per hour for the use of the two-way system. The establishment of user charges provided an important mechanism for financing two-way cable programs which was subsequently used as a basis for charging other groups for the use of the interactive cable system. A grant from the National Endowment for the Arts for a specific program series in folk arts was awarded to BCTV which relied upon the same hourly fee system. The City of Reading has allocated $10,000 to BCTV to pay for the weekly interactive cable television programs between senior citizens and municipal officials and to conduct public hearings about the city's community development funds over the system. The Berks County government has allocated three staff positions under the Comprehensive Employment and Training Act (CETA) to BCTV.

Since the experimental phase ended in March 1977, BCTV has been operated by the local community and continued the organizational framework for developing cable programs in which senior citizens are largely responsible for producing the interactive programs. It has also substantially expanded the scope of the two-way programming and adopted explicit policies to assure public uses of the interactive system. Interactive programming is now conducted during the evening in addition to its daytime hours. In order to reach a wider audience, the mayor and the city council members have moved their teleconferences from daytime to the early evening. Evening programs have also been used to allow citizens to participate in city budget hearings and for replays of selected daytime programs. Citizens in Hamburg and Kutztown, both located approximately 25 miles from Reading, regularly participate in the interactive programs through a microwave interconnect with the Reading system. A local branch of Penn State University uses the interactive system to conduct adult education courses for credit. The content of the programs has been broadened to deal with such community-wide issues as energy, the womens' movement, and ethnic group identity.

A larger number of origination sites for programming have also been developed by BCTV. By rotating the mobile unit among several locations, such as a branch library and city recreation center, the two-way cable system has been able to reach new groups in the community. These new origination sites in combination with the expanded scope and hours of programming have allowed BCTV to serve the non-elderly as well as the elderly in Reading. New organizations have also sought to participate in the two-way cable system. The sponsor of a new senior citizen apartment building has allocated funds to establish a neighborhood communication center for residents to participate in the interactive system. A state mental hospital located 16 miles from Reading has applied for and been awarded a federal grant to purchase equipment to link the hospital with BCTV to reduce the isolation of patients.

An important element in the success of BCTV has been the cooperative relationship which it has established with the local cable television company, the ATC-Berks TV Cable Co. They have provided free channel space for BCTV programming and the regional manager of the cable company considers BCTV to be an important source of the total program services offered by the cable company. Further, he believes that BCTV has helped maintain a stable number of cable subscribing households. It should be noted that the ATC-Berks TV Cable Co. has had a long tradition of support for public access programming; however, BCTV is a distinct and autonomous entity, separate from the cable company's access programming.

A telephone survey of the 35,000 households subscribing to the ATC-Berks TV Cable Co. indicated that 14,140 representatives of households had watched BCTV at least once. Twenty percent of those respondents watched BCTV regularly once a week or more. Two factors make this a highly conservative estimate of regular viewers. First, several senior citizen housing projects, including Kennedy Towers and Hensler Homes, were not included in the sample and more than one household member often watches a television set at one time. Second, the demographic characteristics of those who had ever watched BCTV were substantially different than the target audience sought by most commercial television programs. BCTV viewers were generally older, more likely to be widowed or retired, and had lower incomes than non-viewers. Seventy percent of those who watch BCTV regularly more than once a week are 55 years or older.

With regard to home viewer participation by telephone call-in, only 7.6% of the sample said that they had actually called in to the programs. However, 62.5% of the respondents who had ever called in were people over 55 years old. In terms of both viewership and telephone call-in, BCTV has clearly been able to reach senior citizens, the clientele it was designed to serve.

Conclusion

This paper has focused on the role of local citizens and public sector organizations in the development of an interactive cable television system. However, it is important to note that the role played by New York University extended beyond setting up the technological system and measuring its effects. From the outset, the two-way cable experiment was designed to be open-ended, that is, to have the flexibility to adapt to serve specific needs as they arose on the local level. Consequently, decisions made by the NYU team to alter both the interactive system and the evaluative framework affected the outcome of the experiment.

In addition, since emphasis was placed on both testing the delivery of specific services and allowing the participants to develop uses which they perceived to be important, the effort to "maintain a balance" between these two goals undoubtedly influenced the nature of the programming which emerged. Finally, because the continuation of the two-way system had been an important project goal, NYU provided technical assistance and administrative support in organizing BCTV and in BCTV's initial fund-raising activities; the role of NYU in the establishment of BCTV was a natural outgrowth of the entire experimental framework.

Although there has been extensive discussion of the uses that two-way cable television could serve in urban communities, relatively few public applications have been developed. Cable operators, unlike their counterparts in the telephone company or computer industry, rarely promote the application of broadband communications to the public sector, and public sector bureaucracies can also impose substantial barriers to the use of new telecommunications systems in their on-going service delivery functions.

Thus, it is essential to consider new forms of organizational arrangements for the development of public uses of two-way cable television. The experience in Reading highlights the importance of drawing upon consumers as well as producers of public services in community uses of cable television. It also provides an organizational model for the operation of a community two-way cable system. Berks Community Television, a local nonprofit corporation, brings both senior citizens and service delivery organizations together into a single organizational context for the development of public service uses of cable television.

The emergence of Berks Community Television as a major source of two-way cable programming, represents the most visible and significant impact of the Reading cable television experiment on the local community. BCTV proves that it is possible to produce public uses of two-way cable television without relying on sophisticated technological equipment or a highly paid staff of professionals. It demonstrates that there are human, organizational, and fiscal resources which can be effectively utilized in the operation of a community-based two-way cable television system. The success of BCTV is attributable to the fact that it has identified and brought these resources together in a new technological and organizational framework.

Responsibility for public applications of cable television has traditionally not been considered as an explicit function of either citizens' groups or public officials. The Reading cable experiment points to the need for considering organizational as well as technological and economic issues in the development of community uses of cable television. If urban cable television systems are to be used for public purposes, it will be necessary to systematically consider organizational strategies for the operation of community service programming. Community uses of two-way cable television are most likely to succeed where they reflect the needs and interests of local citizens and public sector agencies. A participatory framework is necessary for the development of innovative and imaginative uses. Such a framework fosters a self-generating process in which the full potential of interactive telecommunications can be realized in urban communities.

COSTS OF THE READING INTERACTIVE CABLE SYSTEM AND ALTERNATIVES FOR REPLICATION

by

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COSTS OF THE READING INTERACTIVE CABLE SYSTEM AND ALTERNATIVES FOR REPLICATION

Introduction

This report has two main purposes: first, to give a detailed account of the actual costs of setting up and running the interactive cable system in Reading, Pennsylvania; second, to analyze the different cost components so others interested in setting up similar systems can estimate what it might cost them. The actual costs of carrying out the experiment in Reading are not strictly appropriate for replication purposes. On the one hand, others would not have to bear the research costs and would also save from our experience of setting up a working community interactive system for the first time. On the other hand, the scale of the Reading system was limited in many important respects by the exigencies of fulfilling the requirements for the National Science Foundation experiment. Not only were there important time constraints, but also limits to the amount which could be spent on hardware and heavy demands on all participants to concern themselves with the research needs in design, implementation, and operation throughout the experimental period. The research for this report therefore, is designed to focus on the cost elements which are fundamental to the operation of the system without these constraints and to present them in a way that enables decision makers facing different situations to make reasonable estimates of the costs of the various alternatives.

While the physical scale of the Reading system was determined by the existing cable capability and the limited hardware budget, the actual configurations of the system and the allocation of tasks were strongly influenced by the goals set for the system. The system is designed to meet 5 main goals:

1. to provide a two-way interactive link between a group of citizens and those who provide services;
2. to train and involve the citizens in all phases of the operation so that they can eventually run it themselves with the minimum of reliance on professional staff;
3. to involve government officials and service agencies directly in the programming;
4. to hire and train a staff from the local community to operate the system;
5. to provide spontaneous interactive programming which is responsive to the needs and interests of the group for whom it is intended.

To test the impact of such a two-way cable system, it was decided to focus on one group of citizens. The elderly were chosen because they are relatively heavy users of existing services, and are known to need many more; yet, they often appear unaware or unable to obtain them. The choice of the elderly, while rich with implications for the effectiveness of such an interactive cable system to reach less educated, less mobile citizens, presented problems for implementation which other groups might not have. In any case, once a system is installed, it can obviously be extended to additional groups for other uses. Thus, while the actual experience in Reading was both geared to and perceived as a system for the elderly, it does have general applicability for a wide range of citizen groups, service deliverers, and government agencies interested in providing interactive programming in their communities.

There are two obvious problems which arise in applying the Reading experience to other situations. First, the requirements of the research took some staff time, but this proved difficult to estimate without burdening the staff with unrealistic paper work. This problem was compounded by the fact that it was difficult to have prior knowledge of what would be the important and relevant activities to distinguish. Second, because this was the first time an interactive NCC system had ever been set up, an enormous amount of time was invested in trial and error learning which should enable others to save time and to organize their activities more effectively. The study, therefore, concentrates on the ways in which savings can be made and makes specific recommendations for future systems.

It is also important to stress that, while there are options for other systems, the technology of the system determines certain staffing requirements and the goals outlined above imply others. The important technological features determining costs are as follows: a) size of the system: three centers and one mobile unit; b) quantity of programming: one-two hours per day, five days a week; and c) existing cable system: operating cable system with partial two-way capability. The effect of the goals on staffing requirements will be discussed in greater detail in the following chapters.

The report is divided into two chapters: one on installation and implementation costs and the other on operating costs. Chapter One is divided into four parts. The first describes in detail the actual costs of installing the Reading system, both in the physical sense and in the implementing sense of training staff and participants to the point where daily interactive programming could begin in January 1976. The second part provides a closer look at the staffing patterns during implementation in Reading and makes recommendations for others interested in replicating the Reading system. The third part deals with possible design variations for other systems. In the last part, a cost function for installation and implementation is presented as a way to summarize these findings. In Chapter Two, the monthly costs of operating the Reading system are analyzed and a generalized cost function is presented, from which monthly operating cost estimates for this and other systems with different design configurations and changing prices and salaries can be calculated. Throughout the report, costs are looked at from five main perspectives:

1. Equipment
2. Cable costs
3. Space costs
4. Labor costs
5. Miscellaneous costs.

The report concludes with a summary of the main findings and major recommendations for replication.

CHAPTER 1

INSTALLATION AND IMPLEMENTATION COSTS OF READING INTERACTIVE SYSTEM

This chapter outlines the costs of establishing a two-way interactive system with three neighborhood communication centers (NCCs). It describes both the costs of equipment, cable, and space and the costs of the staff hired to install the system, to find and train the community people, and to produce interactive programming on a daily basis. The entire operation took eight months, starting in May 1975 and culminating in the formal opening on January 9, 1976. A calendar of implementation from May to December 1975 is given in Appendix A to this report.

In the first section, the actual costs incurred in Reading during this period are outlined. In the second section, estimates of what it would cost to replicate such a system are discussed in detail, drawing from the Reading experience. Lastly, a cost function is described which can be used to figure out what such systems cost given different prices for the important cost items and different choices about the scale and quality of the system.

Actual Costs of Installation and Implementation

The actual costs incurred in Reading during the eight month set-up period are shown in Table 1.1. Full details on the composition of each of the five categories are discussed in the following sections. The initial investment cost of installing and staffing the system to the point where regular interactive programming began was close to $160,000. Equipment was the largest item, more than forty percent of the total budget; staff costs were the other large expense at about one third. The only other significant item was the cable costs which covered the labor costs of installing the system and return lines.

Equipment Costs

A breakdown of equipment costs into major categories can be found in Table 1.2. An itemized list of equipment purchased can be found in Appendix C. The costs include the purchase price for all equipment bought during the experiment. Thus, converters are included although they were actually installed after the interactive programming started. Insurance and maintenance charges are added at a rate of ten percent per annum. However, the estimated costs of labor for installation are excluded from the total equipment costs since they formed part of the services rendered by ATC's Berks Cable TV Co. and are discussed more fully in the next section. The total cost of equipment came to $63,000.[1]

Two major factors determining equipment costs were: (1) the existing two-way interactive capability of the ATC-Berks cable system;

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[1] For fuller details on the most effective deployment of this equipment see: "Design and Implementation of the Reading Interactive Cable Television System" and "Technical Configuration of the Interactive System" in this volume.

Table 1.1

Total Costs of Reading Interactive System During Implementation Period by Major Category

May 1975 - December 1975

1. Equipment Costs (excludes labor costs for installation)	$63,185
2. Cable Costs (includes estimates of labor costs for installation and of the value of production office space)	25,190
3. Space Costs	5,913
4. Staff Costs (includes fringe benefits @ 10 percent)	56,474
5. Other Miscellaneous Costs	8,000
	$158,762

Table 1.2

Cost of Equipment Installed for Reading Interactive Cable System

	$	TOTAL COST
A. System Equipment		
1. Production Equipment		
Equipment purchased	9,824	
Insurance + Maintenance* (7 Months)	574	
2. Head-End Equipment		
Equipment purchased	9,377	
Insurance + Maintenance*(7 Months)	560	
TOTAL FOR SYSTEM		20,335
3. Portable Equipment for Mobile Unit		
Equipment purchased	2,805	
Insurance + Maintenance* (4 Months)	92	
TOTAL FOR MOBILE UNIT		2,897
B. NCC Equipment		
1. For Each Center		
Equipment purchased	10,206	
Insurance + Maintenance* (3 Months)	255	
TOTAL FOR EACH CENTER	10,461	
TOTAL FOR 3 CENTERS		31,383
2. Additional Equipment at one Center only		
Equipment purchased	1,336	
Insurance + Maintenance* (3 Months)	34	
TOTAL ADDITIONAL EQUIPMENT		1,370
C. Converters		
200 Converters @ $18.00 per box (plus estimated installation costs of $18.00 per converter).		7,200
D. Installation		
Estimated Labor Costs	(16,000)	
(These were included in the Berks Cable TV Co. fee, see Table 1.3.)		
TOTAL EQUIPMENT COSTS (excluding labor costs for installation)		$63,185

Note: For details see Appendix C.

*Insurance and maintenance calculated at 10 percent per annum.

(2) the National Science Foundation requirement which limited expenditure on hardware to no more than 10 percent of a total budget of roughly $1 million, in other words, $100,000. Essentially, this meant that experiments could only be conducted in areas that had an operative two-way interactive capability. The ATC-Berks Cable TV Co. system is a 70-mile, bi-directional, dual-trunk delivery system serving 35,000 subscribers with five low-band, 40 FM, seven high-band, and two mid-band channels with a downstream bandwidth of 50-220 MHz. Upstream transmission via a second trunk cable is a low-band return from 50-108 MHz.[2]

In addition to the basic equipment for the system and for each NCC, it was decided to purchase portable equipment for a mobile unit and additional equipment for Horizon Center so that one of the NCCs could accommodate larger groups of participants and have the capacity to transmit graphics for the entire NCC system. This equipment enriched the programming possibilities of the system and enabled us to take full advantage of both the interactive capability of the ATC-Berks cable system and the facilities and services available at the Berks County Senior Citizens Council which was headquartered at Horizon Center. Although, in one sense, these are optional choices for other systems, the Reading experience fully justified the use of this equipment for the experiment. In particular, the mobile unit added flexibility to the system by making it possible to have interactive programming from many different locations. Because a number of sites, including City Hall, some government agency offices, and schools, were already hooked into or nearby the return signal (upstream) cable trunk which comprises Reading's two-way cable system, they could all be connected into the NCC system without incurring any added costs for installing upstream cable.

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[2] The technical details of the design for building the NCC system can be found in: Experiment in Urban Telecommunications. Phase II, Solicitation 74-8. The NYU-Reading Consortium, 1974.

In addition to the three interactive centers, it was also decided for research purposes to connect 117 private homes so that they could receive the interactive programming one way. Although many of the converters were actually installed after the set-up period, it seems appropriate to include their costs as part of the system's equipment. It was expected that useful comparisons could be made between center participants and home viewers. Also, on many programs, the home viewers were invited to call in, and their comments could be heard over the whole system, thus providing another kind of interactive response. Indeed, when it was found through audience surveys how enthusiastic the home viewers were about the programming, the decision was made to transmit the interactive programming to all cable subscribers over Channel 3 starting in October 1976. Thus, although at first available only to homes for which the experiment provided the converter and cable service, a city with a one-way cable system and limited two-way capability could provide their subscribers with interactive programming in this way, at little or no additional cost to the programming providers.

The final item listed under equipment is the cost of installation. The labor costs are estimated as part of the package provided by ATC's Berks Cable TV Co. during the entire course of the experiment, details of which appear in the next section.

Cable Costs

ATC's Berks Cable TV Co. was a member of the NYU-Reading Consortium and has been an active participant in the experiment from the earliest proposal-writing stage to the present day. The station has always been unusually active and community-minded under its Regional Manager and, in a real sense, made the entire experience possible. As such, it is virtually impossible to allocate an appropriate dollar value to the services which were rendered. No direct charge was made for the use of the cable, but a fee of $37,000 was negotiated to cover part of the costs which the company incurred. Table 1.3 provides a breakdown of the specific services which were contracted for the experimental period from May 1975 - February 1977 inclusive. The services included free office and storage space for the production office, labor costs for equipment installation and maintenance, and the cable subscriptions of converter users which were paid from the NSF grant.

In order to arrive at a reasonable estimate of the cable costs during the installation and implementation period, the value of priceable items has been deducted from the total fee and the remainder allocated between the implicit labor costs for installation and for operating maintenance. The cable company manager estimates that the installation period took the equivalent of one full-time worker, while maintenance of the return lines now takes less than a quarter of that effort. Estimated labor costs were therefore allocated on a rough ratio of 4:1 between installation and maintenance costs. The total value of the cable company services is then the sum of the values of estimated office space and installation costs from May 1975 to December 1975 and comes to $17,750. Finally, the cost of the cable for the return lines is added to yield a total cable cost of $25,000.

The costs of the return lines are the actual costs of installing dedicated cable segments to carry an upstream signal between each NCC and the head end. Some segments of upstream cable already existed between two of the NCC sites and the head end. These segments were sections of old trunk cable on which amplifiers had been reversed. All that was necessary was to fill in some added return cable for these sites and to lay the full length of return wire from the remaining NCC to the cable office.

In addition to the specific items listed in Table 1.3, the ATC-Berks Cable TV Co. provided the use of one downstream channel for one hour per day, five days per week from January 1976 until October 1976, when the system was expanded and interactive programming began to go out over Channel 3, a regular downstream channel. Part of the total fee paid to the cable company implicitly represents a fee for leased time, although no explicit charge was contained in the agreement with them. The downstream channel allocated to

Table 1.3

Cost of Cable for Reading Interactive System

Services Rendered by Berks Cable TV Co.: May 1, 1976 - Feb. 28, 1977		
1. Labor Costs for Equipment Installation:		
Directional Capacity between Centers		
Return Lines from Centers		
Converters		
2. Space:		
Office Space for Production Office at Berks Cable TV Co.		
3. Labor Costs for Maintenance:		
Return Lines		
4. Cable Subscriptions for Converter Users		
TOTAL PAYMENT		$37,000
Estimated Value of Priceable Items:		
1. Space: Estimate 525 sq. ft. @ $5.00 p.a. incl. util. May 1975 - February 1977 inclusive (22 months)		
Estimated Value	$ 4,800	
2. Cable Subscriptions for Converter Users 117 Subscriptions @ $6.50 per month for 14 months		
Estimated Value...........	$10,647	
TOTAL ESTIMATED VALUE OF PRICEABLE ITEMS	$15,447	
Estimated Value of Labor Costs:		
Total Payment minus Priceable Items	21,753	
Estimated Allocation:*		
1. Installation and Implementation May 1975 - December 1975	16,000	
2. Operating Maintenance January 1976 - February 1977	5,753	
TOTAL ESTIMATED LABOR COSTS	$21,753	
Estimated Value of Services for Installation and Implementation:		
1. Estimated Office Space for 8 months May 1975 - December 1975	1,750	
2. Estimated Labor Costs May 1975 - December 1975	16,000	
TOTAL VALUE OF CABLE CO. SERVICES		$17,750
Cost of Cable for Return Lines:		
Kennedy: 5,000' .5 Cable	1,900	
Hensler: 7,400' .5 Cable	4,780	
Horizon: 2,000' .75 Cable....................	760	
TOTAL COST OF RETURN LINES		$7,440
TOTAL CABLE COSTS		$25,190

*See text for explanation.

the NCC system originally was a mid-band channel, Channel G. It was not in use and not potentially usable as a regular downstream channel going out to the cable company's subscribers. This channel had always been reserved for closed-circuit, public service uses. However, Channel 3 had been used to carry a commercial RF signal which was duplicated on another channel. No added charge was made by ATC's Berks Cable TV Co. for the use of this channel for the five remaining months of the experiment, because of the cooperative relationship that had been established between the cable company and the other consortium members. It is reasonable to assume that the revenue opportunities of the cable operator for time over both of these channels (closed circuit G and downstream 3) were relatively low.

Space Costs

The only direct rent paid in Reading during the experimental period was $400 per month to Berks County Senior Citizens Council for NCC space in the Horizon Center. The Reading Housing Authority, also a member of the consortium, provided space for the two other NCCs in Kennedy Towers and Hensler Homes at no cost. The estimated value of the free office space also made available at the cable company for the production office has been included under cable costs. Table 1.4 itemizes the costs of renting space during the set-up period along with the cost of telephones and expenses incurred in providing office and other furniture.

Table 1.4

Cost of Space for Reading Interactive Cable System

		$
1.	Rent for Horizon Center	
	$400 per month incl. utilities (4 months)	1,600
2.	Office Equipment at Production Office	
	Furniture	1,768
	Typewriter Rental @ $35 per month (8 months)	280
3.	Furniture at NCCs	
	Total for 3 Centers	975
4.	Telephone	
	Production Office	
	2 Regular Phones @ $50 per month (8 months)	400
	1 Private Line @ $110 per month (3 months)	330
	NCC	
	3 Regular Phones @ $40 per month (3 months)	360
	TOTAL COST OF SPACE	$5,913

Staff Costs

The salary bases and the time employed for all staff hired to set up the Reading interactive system are listed by position in Table 1.5. The total staff costs are calculated from this information and come to a total of $56,474 including fringe benefits for the eight-month period.

In May 1975, the system coordinator and director of implementation opened up the production office and began the process of hiring local implementation personnel and arranging space for the NCCs. Although preceded by a lengthy planning period, it seems appropriate to date the implementation period from the point when the project moved from the planning to execution stage. The two crucial matters decided during the planning stage were the capability of the cable system to adapt to two-way interactive programming and the basis of the relationships within the NYU-Reading Consortium. In other words, these estimates of installation and implementation exclude the time and effort involved in these necessary prerequisites of a workable community interactive system.

During May and June, the NCC coordinators were hired and on June 16th they reported to work. From then, until mid-September (12 weeks), the major activity carried out by the implementation team was the training of NCC personnel (NCC coordinators and technical aides). This training included instruction and practice with the video equipment primarily, as well as developing techniques for recruiting and training elderly participants and planning strategies to involve the elderly at each site in the production and presentation

Table 1.5

Cost of Staff in Reading Interactive Cable System During Implementation

Number	Position	Salary Base $p.a	Percent Time Employed %	Time Employed Months	Total Labor Cost $
1	Dir. of Implementation	26,500	50	8	8,833
1	System Coordinator	15,600	100	8	10,400
3	NCC Coordinator	7,200	100	7	12,600
1	Switcher/Librarian	6,480	100	7	3,780
3	Technical Aides	6,500	100	4	6,500
1	Secretary	6,340	100	8	4,227
1	Technical Director	$125 per diem	n.a.	40 days	5,000
					51,340
		Fringe benefits @ 10%			5,134
					56,474

of programming. In August, the technical aides were hired and they joined the training program. A breakdown of the training curriculum is included in Appendix B. During the latter part of August and early September, a simulation of the interactive system took place, utilizing four sites already wired for cable as the final phase of the training program. In mid-September, the first NCC (Hensler) was occupied by its staff. The two other centers, first Kennedy and then Horizon, were opened in late October. During the remaining two months, the activities involved setting up the NCCs physically and technically, recruiting and involving the elderly at each center and preparing for the formal opening of the system in the beginning of January.

Other Miscellaneous Costs

Finally, on Table 1.6 the remaining miscellaneous costs incurred during the installation and implementation period are listed.

Staffing Allocation in Reading with Recommendations for Replication

Throughout the experiment, records were kept of the time which the staff and others devoted to various categories of activity so that the costs of time inputs could be measured for a variety of research purposes. In this section, the results during the implementation period are discussed in considerable detail as a way to describe staff allocations and activities and in order to make recommendations for the set up of future NCC interactive systems.

Table 1.6

Other Miscellaneous Costs for Reading Interactive System

1.	Video Tape	$
	100 hrs. 3/4" tape @ $34 per hour	3,400
	48 hrs. 1/2" tape @ $25 per hour	1,200
2.	Office Supplies and Postage	
	8 months @ $2,400 p.a.	1,600
3.	Publicity	
	Printing, graphics, advertising, etc.	1,000
4.	Staff Travel Expenses	
	8 months @ $100 per month	800
		$8,000

In the introduction, it was pointed out that the goals of the Reading system had important implications for staffing patterns. The project was committed to four principles which required that a great deal of attention be devoted to appropriate recruiting and techniques for realizing the goals. The four principles were:

1. To hire and train a staff from the local community to operate the system;
2. To train and involve senior citizens in all phases of the operation;
3. To involve government officials and service agencies in the programming;
4. To provide spontaneous interactive programming which would be responsive to the needs and interests of senior citizens.

The research reported in this section was designed to answer the following questions:

1. How long should the implementation period be?
2. How many and what kinds of staff are required?
3. How should time have been allocated in Reading to achieve the goals of the project?
4. How should others allocate time to achieve similar goals?

In order to answer these questions, data were collected on the activities of all the implementation staff. Activity logs were kept by all the staff and later by senior citizen participants and service agency personnel. The allocation of manpower is measured by estimating the labor costs of the different staff in a range of activities which are described in detail below. Labor costs were estimated using the salary information already given in Table 1.5. This technique yields an estimate which is weighted by the numbers of staff, their relative salaries, and the way tasks and responsibilities were allocated in Reading.

Activities were divided into six categories as follows:

1. System Planning and Administration
2. Technical Implementation for the System
3. Center Implementation
4. Training
5. Relations with Community and System Users
6. Program Planning.

Further details of the activities covered in each of these categories will be given in the discussion to follow. It should be noted that this data is fairly crude, both because it was not clear before the event what the appropriate categorization would be and because there was a limit to the amount of detailed paper work busy implementators could be expected to complete.

A coding system was devised as a means of aggregating time inputs of all staff members into common activity areas. A certain amount of bias and distortion is inevitable. Therefore, the definition used for each activity area is important for understanding some of the results. Further, there are a number of activities which fall on the borderline between two areas. For example, when the technical director is repairing a piece of equipment or working out a technical problem and is concurrently explaining what he is doing to an NCC coordinator he is equally engaged in "training" and "technical implementation." When the director of implementation spends time with the administrator of a senior citizens' club arranging for space for an NCC site, she is engaged in "center implementation" but she is also and perhaps equally engaged in "relations with community." In this sense, staff were instructed to record their time as much as possible in terms of the primary purpose behind each activity even when secondary goals were close behind.

The allocation of time to different activities by the different staff positions is presented in Table 1.7. The estimated labor costs are obtained by multiplying each time input by the total labor cost for the relevant position. For example, the input of the system coordinator to "training" is .27 x $10,400 and of NCC coordinators is .40 x $12,600. The labor cost for each activity is then the sum of all the inputs to that activity. The results indicate that system planning and administration, technical implementation, and training each took roughly a quarter of the manpower effort as measured by the labor costs of the activity. Relations with the community and system users was next at 12 percent, then program planning at 7 percent; center implementation was lowest at less than 4 percent.

System Planning and Administration

The first activity, more than any of the others, is an amalgam of different kinds of work. For the director of implementation, the system coordinator, and the technical director, the work included two main kinds of tasks. The first are the traditional administrative tasks, such as coordinating personnel, scheduling staff activities, arranging, directing, and clearing the way for all the other activity areas to take place. The second kind are due to the special character of the system and the commitment to a high level of user involvement

Table 1.7

Time Allocations by Activity During Implementation of Reading Interactive System

Position	Activity: Percent of Time Allocated					
	System Planning & Admin.	Technical Implementation	Center Implementation	Training	Relations with Community & System Users	Program Planning
Dir of Implem.	37%	20%	3%	--	30%	10%
System Coordin.	24%	20%	4%	27%	15%	10%
NCC Coordin.	11%	16%	7%	40%	15%	11%
Switcher/ Librarian	20%	40%	--	40%	--	--
Technical Aides	5%	40%	5%	45%	--	5%
Secretary	100%	--	--	--	--	--
Technical Director	25%	60%	--	15%	--	--
Estimated Labor Costs	$13,712	$12,977	$1,888	$13,028	$6,101	$3,634
			TOTAL LABOR COSTS = $51,340			
Percent of Total Labor Costs	26%	25%	4%	25%	12%	7%

and direction. There was a continual effort, especially on the part of the administrative staff, to stay one jump ahead and to prepare in advance alternative strategies to cover the most likely developments in each area. Thus, the entire staff was deliberately involved in system planning, although in varying degrees. Their ideas and feedback were seen as an important element in this process. In addition, the staff would code all meetings or discussions under this activity where several problem areas were dealt with in a manner which was difficult to disaggregate into other distinct areas. Therefore, the proportions of total staff time and the cost for this activity are higher than would be expected for setting up a similar system.

Technical Implementation

This activity often overlapped with "training." It includes all activities related to designing, ordering, inventorying, installing, experimenting with, debugging, maintaining, and repairing the hardware for the NCC system. The person primarily involved with this was the technical director, although significant time of other staff members was involved as well. Overlap between this area and "training" occurred because a large part of the set-up period was devoted to training NCC coordinators and technical aides so that they could understand, operate, and maintain the equipment. It was not always easy to code a given activity because "training" often occurred when NCC staff assisted in various technical activities and vice versa. The technical director, the switcher-librarian, and the technical aides had the primary responsibility under this heading.

The consensus of the implementation team is that sufficient time and labor were spent on implementing the technical side of the system during the set up and that by the opening in January 1976, most of the major technical problems had been worked out. For others, this activity would not need as much effort during the set-up period. One reason is that this project has produced technical configurations, protocols, and procedures which proved successful, and some may be transferable to similar systems.[3] Much of the time spent by the technical director on the Reading project could be saved in the setting up of future systems if these technical configurations and recommendations can be adopted.

Another saving would occur if the NCC coordinators were not given as much responsibility for the technical operation of the system as on the Reading project. More of this task could appropriately be assigned to the technical aides. This would suggest that the technical aides should be hired with stronger technical backgrounds and experience than those in Reading. A conscious and deliberate aspect of the Reading project was to hire a staff with interpersonal skills rather than with technical experience. The staff could then be trained in technical skills.

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[3] For full details see: "Design and Implementation of the Reading Interactive Cable Television System" in this volume.

Center Implementation

This activity covered the work of negotiating for the sites in which the centers were established, furnishing and organizing the centers, and dealing with other center-related problems which were neither technical nor related to the community. It took the smallest proportion of time input during the implementation period and this appeared to be perfectly adequate. Therefore, there is little to discuss. It should be noted, however, that the amount of effort necessary for this activity in other cases would be related to the number of NCC sites chosen. Thus the director of implementation and system coordinator would have to double their time inputs if the number of centers were doubled.

Training

Training includes all time which the system coordinator and technical director spent training the entire NCC staff and the switcher-librarian. This turned out to take a great deal of time because the NCC coordinators and technical aides were hired without any special skills or experience with either the equipment or programming. However, it is not clear that any substantial savings in training costs can be made. On the one hand, it is obvious that people who are skilled in programming or audience recruitment for two-way cable TV will only become available after considerably wider use of interactive systems. In the meantime, it is possible to find people with more technically sophisticated backgrounds than were chosen in Reading. The salaries, however, might have to be that much higher to offset any savings in training time. On the other hand, if, as has been suggested, NCC coordinators are not given all the technical responsibilities which they had in Reading, their training time could be reduced. The time allocated to training was, if anything, liberal. The staff was well-trained by the start of operations and there was no deficiency in their technical competence.

It was assumed that once the NCC coordinators were trained to operate the equipment, they would then train the elderly to operate at least some of the equipment. The elderly who did become an active part of the production team were interested more in generating programs, presentation, and general running of the centers than they were in the technical side of the operation. If a system is planned which actually anticipates a large number of user-participants who will want to be trained technically, it would be necessary for some of the technical responsibility of the technical aides to be shared by NCC coordinators and for NCC coordinators to have a fair level of technical competence.

Some training of NCC coordinators will always be necessary; they need to understand what is going on with the system hardware. In addition, an important part of the training process for the NCC staff in Reading, particularly for the NCC coordinators, involved training on: (a) basic orientation to this system and how it worked, including a simulation of the system; (b) programming; and (c) recruitment of elderly system users. Technical training is stressed here because the Reading project intentionally hired, as NCC coordinators, people with strong backgrounds in teaching, community and social work, or other work with old people and/or with apparent talents in this area.

Relationships with Community and System Users

Originally this activity was coded as two separate activities. One was called "establishing relationships with local government, organizations, agencies and other groups in the community." The other was called "establishing relations with elderly individuals at each NCC site." Under this activity, the time of the director of implementation was primarily, although not exclusively, devoted to the former. The time of the NCC coordinators was mainly devoted to the latter, while the system coordinator dealt with both.

The work classified under this code includes all activities aimed at finding and contacting potential system users, ascertaining their communication and service delivery needs, eliciting their interest and cooperation, and informing them about the system and its capabilities. This code also includes all the work connected with recruiting potential participants at each NCC site.

It is likely that the time inputs recorded underestimate the actual time spent on these activities. This is partly a result of the coding system, particularly for activities involved in establishing relations with agencies or groups. Most of this work was carried out as a secondary or implicit goal of another activity. For example, contact would be made with the Housing Authority or with a senior citizens club in order to discuss the arrangements for space for an NCC site in their building. The primary activity is viewed as "center implementation," but the implicit goal, which often took up more time and energy, is to establish relations with the community. In fact, nearly every activity carried out by staff during the implementation period, except perhaps closed staff meetings, was part of the broader effort to establish relations in the community. This is especially true of efforts to recruit elderly participants. From the day each NCC site was occupied by its staff, an indirect but quite conscious effort was made to attract the attention and interest of the elderly in the surrounding area while setting up the site physically and technically. It was assumed that an indirect approach to involving elderly participants would work best, which, as it turned out, may not have been true. Later, more direct community involvement and publicity efforts were undertaken.

Strong relationships with community groups and organizations were established during the set-up period in Reading. The goal of recruiting individual elderly participants, by contrast, had not been achieved by the start of operations. Attendance at two of the sites was lower than expected and fewer elderly individuals had come forward to participate in the planning and preparation of programming or in the operation of the system.

The reasons for this are complex. During the first six months the research team insisted that the implementation team keep as low a profile as possible to avoid contamination of the crucial pre-test survey of the elderly. The survey was not completed until November, which left almost no time for active recruiting of elderly participants.

Another difficulty arose from the location of the NCC sites and the characteristics of the elderly population at each site. Two of the centers in Reading were located in public housing for the elderly. At one of these, the residents had a fairly high median age, but median incomes were low at both sites.[4] While they were obvious locations to connect with the elderly and natural locations for fostering communications, the residents at both of these NCC sites contained a high proportion of people whose age, mobility, and educational level did not predispose them initially to produce programming. Such groups may well become active participants, but it takes longer than three months and much effort from the coordinators. This sort of problem is likely to exist whenever NCCs are situated in, or draw their participants from, populations who need social services. Those most in need of better information and communication with service agencies are often those with the fewest skills or aptitudes for the vigorous and enthusiastic involvement which an interactive system requires to get off the ground fast.

There are important implications for manpower allocation during the implementation period. The location of the NCCs and the characteristics of the target population have critical effects on manpower needs. Given the original service delivery goals and the NCC sites selected for the Reading project, more effort was needed to develop relations with potential elderly participants. Most of the work was only carried out during the last three months, with hardly any during the first five months. If the NCC coordinators were relieved of the technical responsibilities as discussed above, they would have more time earlier on. In addition, it would help if more personnel were available to recruit and work with senior citizens in the set-up period.

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[4] For full details of the characteristics of the elderly at the different sites see: "Impact of a Neighborhood Communication Center System on the Elderly in Reading, Pennsylvania" in Volume 2.

An alternative would be to have fewer NCC sites in areas which require such intensive community organization and involvement efforts. It is important that at the start of operations, there are a reasonable number of active participants at each NCC site. It might be possible for a system with three NCC sites to aim for two sites where participation would be reasonably heavy (minimum of 15-20 persons per site per session) and to have only one site where participation was less certain. The disadvantage is that fewer of those more likely to need services will be reached initially and this could lead to an unfortunate bias away from the service delivery goals. In short, there is a trade-off between the effort and costs required to recruit participants and the success in reaching those most in need of services. The increase in labor costs to achieve both goals will depend on the proportion of sites planned to service the poor, elderly, uneducated, immobile or otherwise potentially difficult to recruit.

Program Planning

The set-up activities classified as "programming" include both the actual planning and preparation of test programming which happened in the last two months and the earlier, more general, program planning which took place in discussions and meetings after the NCCs were opened.

Programming for the experimental system in Reading is by design quite different both in style and content from conventional one-way video programming. One of the primary goals of the project was to have a substantial amount of spontaneous interaction among participants, rather than an orderly flow of information from presenter to audience. Program preparation therefore involved creating a series of structures or formats within which spontaneous interactions could occur and selecting topics or themes around which the program could center.

Another important goal related to programming style was to have local community needs form the foundation for this community information system. These goals for program style and user participation in the selection of areas for programming had an impact on the whole process by which programming was prepared or produced. Program preparation, especially at first, was primarily a process of developing relationships with the community in order to recruit people and agencies as system users and participants. It involved gathering a group of people together who were interested and able to interact and eliciting the participation of the community in the selection of topics for programs.

The special nature of the "program planning" process on the Reading project has two implications for this analysis. First, since program planning was so interrelated with developing community relationships, it was often difficult to differentiate time spent on one activity from the other. Therefore, the proportion of total time spent on programming underestimates the actual input. Second, the program planning and preparation process did not follow the original expectations of the planners of the Reading system. In particular, elderly individuals from the community initially participated much less than anticipated. While agencies and organizations were involved from the start, elderly individuals at the NCC sites proved more difficult to recruit as active program planners and producers. This increased the effort necessary from the project staff to prepare programming for the beginning of the operating period and led to the allocation of additional staff to its development. One alternative is to hire a specific person to act as program developer for the entire implementation period

During the operating period, a large number of elderly individuals did become actively involved in the process of planning, developing, preparing, and presenting programming, some as paid staff, others as volunteers. Their role will be analyzed in the last section of this chapter. However, it does take some time, longer than was allowed in Reading, for participants to become familiar and comfortable with the NCC system and its capabilities. Until they do, it may be necessary for the system staff to do much of the program planning. The experience in developing technical formats for programming should make this part of the work less demanding for future NCC systems.[5]

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[5] See: "Design and Implementation of the Reading Interactive Cable Television System" in this volume.

Then the NCC staff will be able to provide a fuller range of test programming and simulations during the final months of the set up, and so hasten the processes of familiarizing and involving potential users with the operation of the system.

The Reading experiment has shown that a programming staff is needed to perform three areas of programming activities during set up:

1. to develop generalized formats within which various specific programs can take place (many of these were developed in Reading and should be transferable);
2. to prepare and present specific test programming during the final phase of set up and most regular programming for the initial phase of the operating period;
3. to assess specific programming needs of local service and government agencies and service needs of the target participant audience.

The results of the Reading experience provide three implications for the allocation of time between these three activities. First, the transitory nature of the project and the unfamiliarity of interactive television does not encourage eager participation in programming activities. This is compounded when the target system users are elderly, poor, disabled, poorly educated, or immobile. If the users do not become quickly involved in programming for these or any other reasons, the NCC staff will have to spend more time on the second two activities. Second, if there is a substantial commitment to social service delivery, a larger time input from staff will be required to develop and prepare the initial programming for the system. This involves an initial survey of local agencies and organizations to find the potential system users and to assess their needs and interests so that the areas of programming to which they are likely to be responsive at the outset can be determined. There then follows a process of motivating the users, selecting services and activities which are amenable to programming for an interactive system, and developing that programming with both service deliverers and clients.

None of the above is intended to imply that service programming is more expensive or more time consuming in its preparation or presentation when specific service programming areas have been chosen. The point is that the selection of these specific service program areas takes skilled staff time during set up. Not all service delivery problems can be adapted to an NCC system. It requires a knowledge both of social service delivery and of the two-way cable capabilities in order to make this choice. Finally, programming activities during set up will increase as the number of hours of origination per day at the start of the operations increases. It would be advisable to start with no more than two hours per day and to expand gradually only in response to the system and user participation.

Summary and Recommendations

In response to the four research questions posed at the beginning of this section, the findings indicate:

Length of Set-up During Implementation Period

Eight months was found to be sufficient, assuming that arrangements with the ATC-Berks Cable TV Co. have been made. The time might be reduced somewhat by hiring NCC personnel who were already trained technically, but this was not the approach taken in the Reading project. Certainly, this period could reasonably not be shorter than six months. It was felt that eight months was sufficient in Reading, but it is difficult to assess what other situations might need. At least in the near future, an interactive NCC system will be novel and unfamiliar in whatever community or area it is being set up. The potential system users and the implementation staff need to go through a fairly lengthy period of learning and experimenting before they can begin to understand how such a system works and what it can be used for. In addition, the user-participatory nature of this system requires a learning and training period before the start of operations. Thus, during the set-up period, the system planners and builders should be assessing local needs and preferences, building relationships with the user-community, and arousing interest and enthusiasm, as well as working with local government and service agencies to determine which of their service delivery and other communication needs can be adapted to a two-way NCC system and which specific program formats can best be used.

Staffing

Based on the Reading experience we would recommend additional expenditures of staff for setting up a tri-center interactive system. Although the Reading staff did succeed in preparing the system in eight months, there was a serious lack of elderly participants at the beginning. Our staffing recommendations, which can be found summarized in Table 1.8, call for the following additions during the implementation period to deal with this problem:

1. One director or coordinator of programming, full-time, for 6 months
2. One publicist, full-time, for 4 months
3. Three senior aides, part-time, for 3 months.

In addition, we suggest a full-time technical director. Using salary bases close to Reading's, these additions increase the total labor costs from roughly $50,000 to $70,000 for the eight-month implementation period.

Allocation of Staff

In Reading we found that three-quarters of the staff effort went into three activities: "system planning and administration," "technical implementation," and "training." We also found that insufficient time was available both for developing relationships with the elderly and system users and for program planning during the implementation phase. Apart from the obvious difficulty of involving people before the system is actually working, extra burdens were imposed by: (a) the fact that this was the first time such a system had been set up; (b) the intrinsic difficulty of involving elderly citizens in innovative and technical systems; and (c) the requirements of a research experiment. Future users will gain from our experience, particularly in the use of technical formats and methods for recruiting and training the elderly; presumably, there would not be the same research requirements. In addition, we recommend shifting some of the technical responsibility from NCC coordinators to technical aides. This would release the coordinators to spend more time on community relations and program planning.

Table 1.8

Recommended Staffing for NCC Interactive System with Three Centers During Implementation

Number	Position	Salary Base $p.a.	Percent Time Employed %	Time Employed months	Total Cost $
A.	System Staff				
1	System Coordinator	15,000	100	8	10,000
1	Technical Director	12,000	100	8	8,000
1	Dir. of Programming	12,000	100	6	6,000
1	Switcher/Librarian	7,200	100	6	3,600
1	Secretary	6,000	100	8	4,000
1	Publicist	7,800	100	4	2,600
B.	For Mobile Unit				
1	Technical Aide	7,200	100	7	4,200
	Center Staff				
3	NCC Coordinators	8,400	100	7	14,700
3	Technical Aides	7,200	100	7	12,600
3	Senior Aides	7,200	50	3	2,700
	For Additional Equipment at 1 Center				
1	Technical Aide	7,200	50	7	2,100
					70,500
			Fringe benefits @ 10%		7,050
		TOTAL RECOMMENDED STAFF COSTS			$77,550

In addition, we found that a critical variable in terms of both staff requirements and allocation of effort was the characteristics of the target population for the NCC system. If a system is targeted on potential eligibles for social services, the task of setting up and developing initial programming falls heavily on paid staff. Planners for such a system cannot expect much contribution from the target group before the beginning of operations unless they spend more effort on recruiting.

Finally, it should be noted that the whole Reading project benefitted from the relationships previously developed by NYU's Alternate Media Center in its public access work in Reading. This has been assumed to be part of the planning phase preceding the implementation period. Others will face different situations which cannot be predicted. The important point is that these estimates of time, staff, and allocation presuppose a prior planning period during which the basic relationships have been established and the technical capability ascertained.

System Design in Reading and Alternatives for Replication

In this section, the implication of the system design for costs is discussed and possible variations are analyzed in light of the Reading experience. It is assumed that others wishing to replicate the NCC system would have similar goals to train local community people, to involve participants and service deliverers, and to provide spontaneous interactive programming. Further, it is assumed that there is an operative cable system. Therefore, the costs of adapting a one-way system to two-way are analyzed while the costs of installing an entire cable system are not discussed.

System design variations are discussed under five main headings:

1. Scale of the System
2. Use of a Mobile Unit
3. Quantity and Style of Programming
4. Cable Costs
5. Space for NCCs.

Scale of System

The main factor which will determine the cost of installing an NCC system is its planned scale (that is the number of permanent originating interactive sites, NCCs, in the network). The Reading system had three permanent interactive sites from which programming was produced and originated and was designed to include interaction from other "remote" sites using a mobile unit. This unit could be connected into the interactive system from any of various wired locations throughout the city and thus provided additional places for origination. This section is concerned only with the question of increasing the number of NCCs, or permanent fixed sites. The next section will deal with the alternatives introduced by the use of the mobile unit.

There are limits to the variations in scale that are possible for an interactive NCC system. On the one hand, any interactive system must have at least two origination sites. On the other hand, systems with more than seven interactive sites are likely to be quite different from the Reading system. Furthermore, the Reading experience suggests that there is little justification for starting with more than two or three permanent NCC sites, and that more than four such sites makes initial implementation very complicated. Therefore, the cost function described in the

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next section has been specified to allow for variation from two to seven NCCs. This is the range which the implementation supervisory staff recommended in the last section could reasonably handle; any more sites would need a rather different staff structure.

There are serious problems to starting with a large number of permanent interactive sites. First, there is a substantial investment in equipment for each NCC, which is even higher in areas where the cost of laying wire for each site is high. A second issue is that since each permanent site is, in effect, a producer and originator of programming, having very many such sources of programming can complicate the interaction between them. It may also duplicate productive resources and present queueing problems with the sites competing for a chance to be seen and heard by the others and to contribute programming within limited hours of programming. Such increases in the scale of the system could overtax staff resources.

Furthermore, given the use of mobile units which can link other locations interactively with NCCs, there seems little need for incurring the costs and risks of starting out with a large number of permanent sites. There are also difficulties in successfully attracting a reasonable number of attendees to permanent sites on a regular basis. This process proved far more lengthy and uncertain in Reading than originally anticipated. The amount of manpower required to recruit participants, to produce programming, or simply to interact at a session can be considerable, and even then success is far from predictable.

It must be remembered that the initial selection of NCC sites will always be made before the system comes into existence, when relatively little is known about the demand for participation in interactive programming by the target population. It seems unlikely that many sites are necessary for the initial success or quality of the system, indeed, for reasons mentioned above, they may reduce the quality. It will always be possible to add further sites if there is sufficient demand. In any case, it will take some time before such needs are evident. Thus, programming can be developed and technical problems worked out while the audience is building for the cable programming, from which the participants for the expanding number of sites can be drawn.

Finally, it should also be noted that the choice of site will have effects on other matters of concern. For instance, the kind of interaction and programming which is possible will be influenced by the characteristics of the people using the centers, as well as the extent to which these characteristics differ. Although the Reading centers all involved the elderly, and had a similar ethnic composition, the income, education, and age levels were significantly different. The particular institutional arrangements may also make a difference to how the participants feel about the system; if the centers "belong" to the users, they are likely to respond differently than if the space is situated, for example, in a service agency or cable television studio.

Mobile Units

The mobile unit greatly enriched the Reading system but is only economical within cable systems which have at least some two-way capability. The use of mobile units, if possible, expands the scale and versatility of an NCC system with only a small increment to the investment costs. This is because one operator with the equipment can connect from any place which is linked to the two-way part of the system.[6]

In designing an NCC system, there is some trade-off between NCCs and other sites which can be connected into the system with mobile units. However, there are limits: the system should have at least two permanent regular interactive sites (NCCs); any site which will be attended daily by a large number of participants should probably be an NCC; any site with few regular participants or with a large group of participants who attend only at intervals, such as a club that meets once a week, would make an ideal remote site. The most important factor is whether a two-way cable capability already exists, for if it does not, the cost of installing two-way capability between these sites and the head end will increase the initial investment costs dramatically.

If the NCC system is mounted within a cable system with extensive two-way capability, the main consideration is whether or not participation at a given site will be sufficient to justify the investment costs of establishing a permanent NCC site rather than occasional connections with the mobile unit. Once the mobile unit and staff hired to operate it have been acquired, adding sites to the system does not increase these costs. The system in Reading, with three

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[6] The mobile unit can be linked by microwave to the cable system.

NCCs, was able to draw on the fairly large area of the city which had two-way capability and used a total of nine non-NCC sites; three were used regularly and six irregularly.

If the NCC system is mounted in a cable system with limited or no two-way capability, each additional site adds the cost of installing two-way capability to total installation costs. (It is assumed that no site would be considered for use as an NCC or as a remote which is outside the area wired with downstream cable.) Since laying cable is quite expensive in many areas, it will not make sense to wire a site and then use it only on an infrequent basis, unless there are very substantial benefits attached to its inclusion in the interactive system on an infrequent basis. There was one such site in the Reading system, the local Social Security office, which was wired for two-way capability and participated once a week. This permitted elderly system users to receive information, ask questions, and otherwise communicate with what was, for most system users, the major service-providing agency.

In general, the additional non-NCC sites in the Reading system were drawn from areas already provided with two-way capability. However, even in a system that has full or partial bi-directional capacity, the individual NCC installation costs are substantial and there is always uncertainty about how heavily a site will be attended by the target audience. Therefore, the best system design may be two regular interactive sites (two NCCs) plus as many non-permanent sites as desired; the more extra sites, the lower the initial installation and equipment costs. There will also be substantial savings in operating costs. Finally, it will always be possible at some later date to convert such sites to permanent NCCs if the demand for them becomes evident.

Quantity and Style of Programming

The Reading NCC system was geared to produce one to two hours of programming per day, five days per week. A major factor determining the number of hours per day of origination to be chosen will be the availability and the anticipated operating costs of downstream cable-channel time. If channel time can be provided free through public access channels, or other arrangements, the most important cost variable affected by hours of programming will be labor costs, both the supervisory production office staff and the numbers of staff attached to each NCC.

The number of NCC staff is the variable most sensitive to planned hours of daily origination. Two NCCs in Reading had two full-time staff and the larger had three; with the addition of a senior aide at each, it is estimated that the maximum hours of origination per day which could be handled is three hours. For a system with more than three hours, it would be necessary to hire at least one more technical aide and one more senior aide, per NCC. In addition, a relief head-end switcher would be necessary. This added personnel could handle up to three more hours of origination a day.

The original plan in Reading called for a far larger input of volunteer labor in program planning and preparation by potential elderly participants than in fact were found in Reading before the system was opened up. Furthermore, because the Reading project was a research project, part of the process of selecting and developing social service areas for programming was carried out by the research staff. In the previous section, it was recommended that a full-time director of programming be hired early in the implementation period to handle program planning. For a system to produce more than two hours per day of origination from the beginning, without duplication of programming, would mean that an additional program planner should be hired, unless there is good reason to suppose there will be a large number of volunteers from system participants, as, for instance, in schools. Nevertheless, we would recommend that even if it is expected to end up with more hours, it is better to plan one to two hours at first and to expand only as the system develops.

Before the system actually begins operation, the director of programming is unlikely to have as high a level of cooperation and participation as necessary for the programming to reflect the needs and interests of system users. The major task of the director of programming during this period will be to stimulate local input and to develop a limited amount of programming which will attract target participants. The major proportion of user input during this period will come from service providing agencies and organizations. Since an expansion of programming can easily be accomplished by the same size staff once the initial shakedown has passed, it would seem unnecessary to prepare a great deal of programming when there may be comparatively little feedback from system users.

Finally, it was believed that setting up with a large, professional programming staff in Reading would preclude both the necessity, and hence the possibility, for elderly system participants to enter into the program planning and production process as genuine partners. By starting out with only a limited amount of programming, it is possible to present formats which are sufficiently attractive to arouse the interest of viewers and participants, while still allowing considerable latitude for expansion of the system as more active user participation in the program planning process is forthcoming.

The type or style of programming may also have an impact on costs. It is clear that some kinds of programming cost more to produce than others, and the Reading system, as it evolved, did produce a wide variety of programming. During the operating period, the inputs for each type were logged and these are analyzed in the next chapter. Only simulations, not live programming, were produced during the implementation period, and these only towards the end. It is possible to experiment with different types of interactive programming only when the system has attracted a sufficient number of participants at each site.

Space for NCCs

The space for two of the NCCs in Reading was donated without cost by local public agencies. The space for the third site in Horizon Center was rented from the Berks County Senior Citizens Council, a member of the NYU-Reading Consortium. The siting of the NCCs is of great importance in determining their effectiveness; in particular, it is important that the space at each site be available for use as an NCC for most of the daytime hours. The fact that Kennedy space was only available for limited hours during the day posed severe problems during the operating phase when the number of hours of daily origination was expanded. However, there is a trade-off between the availability of space and its proximity to users, especially if rent is to be paid. Rents are likely to be higher in more densely populated areas, which are precisely the most desirable places for NCCs, where large numbers of people will easily come into contact with the system. It would probably be better to have fewer permanent sites than to use sites which were available only part time or at high cost.

Costs of Cable

There are two major aspects to take into account when considering alternative cable costs: one is the charge imposed by the cable company for use of the cable; the other is the cost of converting a one-way system into a system which has two-way interactive capability, at least between permanent sites within the NCC system.

Cable company charges. There are two kinds of charges which might arise for those contemplating interactive systems: one is the installation charge and subscription payment for obtaining one-way viewing of interactive programming; the other is a charge for the leased time on a downstream cable. The first is usually carried by the individual consumer who is paying for the reception of all television channels, not just the interactive programming. Until pay cable television is widely available and carries interactive programming, there is no way to discover the specific demand for such programming and certainly no appropriate price estimate.

However, it is worth considering the provision of one-way viewing of interactive programming to special categories of consumers who cannot afford the cable company charges for installation and/or monthly reception. In Reading, the project paid for the subscriptions of 117 converter users and the cable company absorbed the charge of installing the converters in its overall fee as discussed earlier in the section on cable costs in this chapter. Of the 117, only 26 were not already cable subscribers while 91 were; when the experiment ended, 17 of the 26 continued their subscriptions. Since a cable subscription provides many extra channels, it is not clear that the interactive programming alone had made subscribing worthwhile for these additional customers. It is striking, though, that three-fourths of the families included in the study, who had not received cable prior to the experiment, were willing to pay for their subscriptions at the end of the experimental period. Another argument for providing one-way viewing is to install it for those who cannot afford installation, for example, the poor and the bedridden. For instance, one nursing home was connected in Reading and other institutions would provide obvious candidates for free provision of the necessary cable connections.

The results of both the audience surveys during the experiment and the main research survey indicate that home viewers with converters watched the interactive programming far more than residents near centers came in to participate. Furthermore, there is some evidence that home viewers did learn more from the programming and had their attitudes about themselves and government improved more than other experimental groups.[7] Obviously, watching at home is a very different kind of activity from participating in centers; however, since access to one-way viewing of interactive programming is the most realistic expansion of the two-way systems, given the lack of many operative two-way cable systems, it should be a serious consideration. Since so many viewers already subscribe, it is often a costless expansion. The only possible concern might be that home reception reduces center participation. Our findings were inconclusive on this question, but it certainly did not seem that home viewers reduced their outside activities in general; in fact, there was some evidence that they participated more in senior citizen clubs. There were also some indications that the experimental groups with access to the interactive programming were encouraged to go to Horizon Center more than the groups without access.

The second charge which may arise is payment for leased time on the downstream channel. For any NCC system, this possible cost depends on the value of time over cable channels reserved for local origination, public access, or for local government use (Class 2 cable channels). Thus, for any interactive system entitled to use public access channels, it is unlikely that there will be a cost for channel use, since they are not customarily leased to users but are supplied by the cable operator in accordance with government regulatory requirements. However, there is an economic resource cost which is interesting to consider. The usual way the value of such a public good is estimated is based on its opportunity cost, that is, what could have been earned from the channel time if it were not used for this programming. In any cable system, the economic cost or estimated value for the use of such a channel would depend on:

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[7] See: "Impact of a Neighborhood Communication Center System on the Elderly in Reading, Pennsylvania" in Volume 2.

1. The number of channels in the cable system and the amount of unused time available, if any;
2. The availability of and perceived demand for other non-commercial programming sources;
3. The nature of local franchising agreements and the relationship between the cable operator and local government;
4. The federal and other requirements for public access, local origination, and municipal channel use that bind the cable operator.

Cost of upstream cable. For a system without two-way (or with only partial two-way) capability, the costs of connecting NCCs depends upon the costs for installing the upstream cable. These costs have to be computed on the basis of the unwired distance of the sites from the head end and the cost per mile of laying cable or the cost of conversion from one-way to two-way capability. Since both two-way capability and the cost of laying return cable vary considerably across cable systems, these costs would have to be calculated independently for future NCC systems in other places. The magnitude of this cost component will have a strong impact on the selection of sites for NCCs.

Since at present only a few cable systems have bi-directional capability, the cost of an NCC system in an existing cable plant will include the cost of installing segments of return (upstream) cable to carry a signal from each NCC site up to the head end. Assuming that, in such places, the costs of installing return cable will be approximately 90 percent of what it would cost to install original (downstream) trunk cable in the same area (the 10 percent difference is due to the absence of added pole rental fees); then the costs of laying this upstream cable will vary anywhere from $3,500 to $75,000 per mile. In general, cable installation costs vary inversely with the optimal distance of NCCs from the head end. In rural or geographically dispersed areas, the lower installation cost per mile will more than compensate for the greater distances to be covered. In urban areas, there will probably be less need for widely dispersed NCC sites but the costs of laying cable will be considerably higher.

In order to show the impact of this component on installation costs, the following examples of this cost component for NCC systems with varying levels of cable installation costs and different NCC dispersions are illustrative:

1. For an NCC system, mounted in a cable system with one-way capability only, located in an urbanized area with each NCC approximately 2 1/2 miles from the head end and cable installation costs of $50,000 per mile; the installation costs will be $125,000 per NCC.

2. For an NCC system, mounted in a cable system with one-way capacity only, located in a less densely populated area with each NCC approximately 7 miles from the head end and cable installation costs of $5,000 per mile; the installation costs will be $35,000 per NCC.

As the size of this capital investment grows, it becomes more important that the NCCs be used more intensively, both in terms of the numbers of people who use them and the number of hours per day in which origination takes place.

Summary of Main System Design Recommendations

Scale of system. We recommend starting with no more than two or three permanent NCC sites. These can be expanded when the system is established and more is known about demand and willingness to participate.

Location of sites. We recommend that NCCs be located in places to which a substantial number of the target population have access. It is important to have a core group of active participants in the beginning, so that the programming reflects citizens' needs and interests. Furthermore, the more people involved, the more experimentation with programming ideas can take place, and the faster the most effective ways of reaching out can be found.

Mobile unit. For systems with a pre-existing two-way capability, we strongly recommend purchase of a mobile unit. It adds many more possible points of origination and adds greatly to the flexibility of programming and system expansion. Mobile units can be used to discover whether there is a demand for participation without the large fixed investment costs in NCC equipment. They provide unique opportunities for originating from a variety of service delivery locations. For systems without the two-way capability already installed, the cost of connecting a variety of places may well be prohibitive.

Hours of origination per day. We recommend starting with no more than one or two hours per day. It would probably put a heavy burden on programming staff during implementation to provide more and could always be expanded.

Connecting individual subscribers one-way. We recommend connecting subscribers one-way. We did not find any adverse effects on participation in the interactive system from the availability of home viewing Where most viewers are subscribing to cable already, it can cost virtually nothing. We also recommend the provision of one-way reception for low-income home-bound citizens and people who are confined in institutions.

Cost Function for Installation and Implementation of an Interactive NCC System

The purpose of this section is to present the costs of installing and implementing an interactive NCC system in a generalized form so that others can estimate the consequences, based on these costs, of different choices and circumstances which they may face. On the one hand, the prices of various items will undoubtedly differ; salaries in particular will vary considerably from place to place, and some items may not cost anything, such as cable and space. On the other hand, there are a number of design variations which have implications, not only for equipment costs, but also for staffing requirements. The cost function presented below enables others considering NCC systems to trace out the effects of these variations on their investment costs. A similar function is presented for operating costs at the end of the next section.

Since there are overhead costs which are shared by the whole system, the first step in constructing the cost function from the various cost components discussed in this chapter is to allocate items according to whether they are part of this shared cost or are specific to the NCCs, which can vary in number. This division applies to staff costs, as well as equipment costs, where the principle is more obvious. The second step is to set the appropriate relationship of the various optional choices to total costs.

Table 1.9 shows all the cost components used in the cost function by major category as discussed earlier. Table 1.10 shows the allocation of individual cost components to (1) shared system costs, (2) NCC costs, and (3) optional variations. Total costs will be the sum of the costs under each category and can be described as follows below.

It should be noted that the cost of expanding the number of NCCs, as reflected in C_6, represents only the additional shared costs of extra monitoring and switching equipment at the head end. The cost of the extra NCCs themselves is included in the basic system equation, or the multiple (a) to represent the number of sites. The technical consultant at Reading estimated that the extra equipment would cost roughly $1,400 for a 3-NCC system to expand to 4-7 centers.

The complete cost function is then represented by the addition of equations (1), (2), and (3) as follows:

$$\text{Installation and Implementation Costs of Interactive System:} = C_1 + aC_2 + C_3 + bC_4 + cC_5 + dC_6 + eC_7 \quad (4)$$

Using equation (4), the recommended staffing patterns and salaries outlined in Table 1.8 and costs of all other components as experienced

Table 1.9

Cost Components Of NCC Interactive System for Installation and Implementation by Major Category

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Equipment Components: to include labor costs for installation

E1 = Production Equipment
E2 = Head-End Equipment
E3 = Portable Equipment for Mobile Unit
E4 = NCC Equipment
E5 = Additional Center Equipment
E6 = Converter Costs
E7 = Additional Monitoring and Switching Equipment

Cable Components:

A1 = Fee to Cable Operator for Downstream Cable Channel Use
A2 = Installation of Cable for Return Lines
A3 = Fee to Cable Operator for Maintenance of Return Lines
A4 = Cable Subscriptions

Space Components:

S1 = Rent for Production Office
S2 = Rent for NCC Space
S3 = Telephone for Production Office
S4 = Telephone for NCC
S5 = Office Equipment at NCC
S6 = Furniture at NCC

Labor or Staff Components:

L1 = System Coordinator
L2 = Technical Director
L3 = Director of Programming
L4 = Switcher/Librarian
L5 = Secretary
L6 = Publicist
L7 = NCC Coordinator
L8 = Technical Aide
L9 = Senior Aide

Miscellaneous Costs:

M1 = Video Tape
M2 = Office Supplies, Postage, Publicity
M3 = Travel Expenses

Table 1.10

Allocation of Cost Components into Cost Variation Categories*

I. BASIC SYSTEM COSTS

A. Shared System Costs = C_1

Equipment = $E_1 + E_2$

Cable = A_1

Space = $S_1 + S_3 + S_5$

Labor = $L_1 + L_2 + L_3 + L_4 + L_5 + L_6$

Miscellaneous = $M_1 + M_2 + M_3$

B. NCC Cost = C_2

Equipment = E_4

Cable = $A_2 + A_3$

Space = $S_2 + S_4 + S_6$

Labor = $L_7 + L_8 + L_9$

II. OPTIONAL VARIATIONS

A. Additional NCC Equipment = C_3

Equipment = E_5

Labor = L_8

B. Mobile Unit = C_4

Equipment = E_3

Labor = L_8

C. Converters = C_5

Equipment = E_6

III. EXPANSION COSTS

A. Increase NCC from 3 to 7 = C_6

Equipment = E_7

B. Increase Hours of Origination from 1-3 to 4-6 = C_7

Shared Labor = $L_3 + L_4$

NCC Labor = $L_8 + L_9$

$$\therefore C_7 = L_3 + L_4 + X(L_8 + L_9)$$

where X = Number of extra NCCs

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[*] For description of cost components, see Table 1.9.

Table 1.11

Comparison of Actual and Estimated Costs for Reading Interactive System During Implementation

Cost Category	Actual Costs	Estimated Costs
Equipment	63,185	73,185
Cable	25,190	14,613
Space	5,913	7,462
Staff	56,474	77,550
Miscellaneous	8,000	8,000
	158,762	180,810

Basic System Costs

$$\text{Interactive system cost} = C_1 + aC_2 \tag{1}$$

where: C_1 = Shared system cost
C_2 = NCC cost
a = Number of NCCs

Optional Variations Costs

1. Equipment variations:

$$\text{Optional equipment costs} = C_3 + bC_4 + cC_5 \tag{2}$$

where: C_3 = Additional center equipment cost
C_4 = Mobile unit cost
C_5 = Converter cost
b = Number of mobile units
c = Number of converters

2. Expansion variations:

$$\text{Costs of expansion} = dC_6 + eC_7 \tag{3}$$

where: C_6 = addition to shared cost where $d = 1$
C_7 = addition to costs where $e = 1$
d = 0 when $1 \leq a \leq 3$
= 1 when $4 \leq a \leq 7$
e = 0 if system is to originate 1 to 3 hours per day
= 1 if system is to originate 4 to 6 hours per day

in Reading yields the following cost information:[8]

Shared system cost	$76,483
Cost per NCC	28,310
Additional NCC equipment cost	3,680
Mobile unit cost	7,517
Converter cost	11,200

With three NCCs, the total estimated installation and implementation costs for a Reading kind of system, at Reading prices, and with recommended staffing for such a system was $180,810. The additional staff accounts for the increase of $20,000 over the Reading costs presented in Table 1.1. Table 1.11 compares actual and estimated costs for the Reading system by major category. Other than labor costs, the only important difference is that the estimated values for the labor costs of installation and for production office space were assigned to cable costs in the actual Reading costs because these were paid to the cable company. In the estimated cost function, these items were assigned to equipment costs and space costs respectively.

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[8] It was necessary to allocate the estimated value of ATC's Berks Cable TV Co. services to various different cost components (see Table 1.3). Of the total of $21,753, $5,753 for 14 months was allocated to cost component A_3, Maintenance of Return Lines; this came to $137 per month per NCC. The $16,000 estimated labor costs for installation were allocated as follows:

Shared system cost: Component E_1 (Production Equipment)-$6,000
Cost per NCC: " A_2 (Cable Installation) -$2,000
Converter cost: " E_6 (Converter ") -$4,000

CHAPTER 2

OPERATING COSTS OF THE READING INTERACTIVE SYSTEM

In this chapter, the costs of operating the interactive system are analyzed from two perspectives: the actual costs and the costs of replicating the Reading system. In the first section, the current costs of running Berks Community Television (BCTV) are outlined in detail. In the second section, the operating costs of replicating the Reading system with the recommended staffing patterns are described. The costs of cable and space are also discussed. Finally, a cost function of the different components is presented to complement the implementation cost function in the last chapter. Estimates of the recommended operating costs are then compared to current Reading costs.

Daily interactive programming began on January 9, 1976 and marks the opening of the operating period. The major cost difference between the installation and operating periods is that there are no longer expenditures for equipment and cable once the system is in place. The salaries for the staff to run the system become the most important cost consideration. The January date is fairly arbitrary. That was when the work of installing basic equipment, working out technical problems, and training operators was completed. Although the converters were put in during February and March 1976, the cost of doing this was computed as part of the installation costs. More critical for the proper assignment of costs was that both programming and recruiting elderly participants had only just gotten off the ground. In general, it is obvious that any system such as this, particularly since this was the first, will have a period of settling down before anything like normal operations are the rule.

For these reasons, which were compounded with the research and government project requirements, the costs of operating the project are not appropriate measures of what it would cost others to run the kind of system we have recommended. The project ran until February 1977, but before that date, enough local support had been generated to organize Berks Community Television and raise enough funds to keep the interactive system running. It is still very much in business as this report is being written. Since the costs of this operation are much closer to what others without National Science Foundation backing might expect to face, they will be described first.

When it comes to estimating what it would cost others to operate, it is important to take into account the higher operating costs during the settling-in period. Consequently, two estimates are made of monthly operating costs; one for the initial operations, which took a year in Reading, and one for operations thereafter. Another way of looking at this distinction would be to estimate the higher operating costs as part of the initial investment costs. Information will be presented to include the necessary adjustment.

Actual Monthly Operations Costs of BCTV

The monthly costs of running the three-NCC interactive system are presented in Tables 2.1 and 2.2, which outline staff costs and non-staff costs respectively. The information in these tables has been taken from the Berks Community Television (BCTV) Operating Budget, November 1977 - October 1978, which together with BCTV's financial statements, projected income for the coming year, rate schedule, and job descriptions, are reproduced in Appendixes D, E, and F. The monthly salary costs are $6,460 including 7% for fringe benefits and $1,826 for other costs, making a total of $8,286 per month or just under $100,000 for the year.

BCTV Staff

The full-time staff consists of an executive director, who has the responsibilities described for the system coordinator, a production and programming director with a production assistant, one secretary and technician grade III, which is the lowest of three skill grades devised. The production and programming director was hired and trained as an NCC coordinator in the initial training; the executive director was hired as technician and program researcher. The centers are all staffed by part-time workers. The three part-time technicians, one of whom is a senior citizen, were all part of the original community team hired as technical aides in 1975. The senior producers and aides were trained during the course of the experiment. They are now primarily responsible for all the program planning and presenting at the NCCs. The technical staff operate the cameras during programming and provide the technical expertise.

There were two assumptions about the nature of senior citizens' participation which proved to be incorrect during the course of the experiment. Initially, it was expected that the elderly would volunteer for training on the technical side and eventually take over the technical operations. However, it turned out that most of the elderly preferred to be involved in programming and presentation activities rather than in the operation of video equipment.

The second incorrect assumption was that the elderly would want to volunteer, or at least not earn more than the maximum before earnings are deducted from Social Security payments. In fact, the original NSF budget called for three part-time technicians for fifteen hours a week and nine senior aides at twenty-one hours a week, all to be paid $2.20 an hour. Three senior aides are currently paid $2.50 for ten hours a week. But the three senior producers and one senior aide felt that they should be paid the appropriate professional rate. So their salary bases are comparable to the technicians scale. The rest of the time contributed by seniors was volunteered and is discussed in the next section.

It is important to note that the salaries of six of the staff members are supported by two separate government programs. Three full-time positions (the production assistant, full-time technician III, and the secretary) are supported by the Comprehensive Employment and Training Act (CETA) and two senior producers and a senior aide are supported by the American Association of Retired Persons (AARP). These supported salaries amount to $30,000 for the year, or almost half of the staff costs. Fuller details are available in Appendix D. This represents a substantial subsidy to the operation of the NCC system.

Table 2.1

Monthly Operating Cost of Staff at BCTV

Number	Position	Salary Base $ p.a.	Percent Time Employed %	Total Monthly Cost $
1	Executive Director	12,000	100	1,000
1	Production/Program Director	10,656	100	888
1	Production Assistant	7,800	100	650
1	Secretary	6,825	100	568.75
2	Technicians-Grade I	9,096	50	758
1	Technician-Grade III	5,850	100	487.50
1	Technician-Grade III	5,460	50	227.50
1	Senior Producer	7,800	50	325
2	Senior Producers	5,200	50	433
1	Senior Aide	5,200	50	217
3	Senior Aides	2,800	50	350
1	Publicist	6,240	25	130
				6,034.75
	Fringe @ 7% p.a.			422.43
	TOTAL MONTHLY STAFF COSTS			6,457.18
	ANNUAL STAFF COSTS			77,486.16

Table 2.2

Monthly Operating Costs Other Than Staff at BCTV

Cost Items by Category	Total Monthly Cost $
1. **Equipment**	
Maintenance	529
Sundry Items	40
2. **Cable**	-
3. **Space**	
Telephone	279
Typewriter Rental	40
4. **Miscellaneous**	
Videotape	350
Office Supplies and Postage	163
Program Supplies	35
Printing and Advertising	80
Staff Travel Expenses	100
Petty Cash	10
5. **Professional Fees**	200
TOTAL MONTHLY NON-STAFF COSTS	$1,826
ANNUAL NON-STAFF COSTS	$21,912

The exciting development for financing such systems is that BCTV has already started to receive income for its services. In the first year, this largely took the form of grants and donations. A total of $29,000 was raised in Reading, most of it from organizations, but some from individual donors. In July 1977, a contract was arranged with the Berks County Area Agency on Aging to present eleven programs on pre-retirement at $500 an hour for a total budget of $8,600. The Executive Director of BCTV is currently negotiating contracts with other agencies to cover the costs of operating the interactive cable system. Fuller details are given in the appended materials from Berks Community TV and in the final report to the National Science Foundation on community involvement and impact.[9]

Non-Staff Costs

As can be seen from Table 2.2, the non-staff operating expenses for BCTV are very modest (under $2,000 per month), and roughly one-fifth of the total annual budget. Apart from the telephone at roughly $300, and equipment maintenance at $530, the other items fall under the miscellaneous category as described earlier. In addition, $200 a month is reserved for professional fees (mainly technical assistance), since the technical director is no longer employed by the system. Equipment maintenance is the largest single item; it includes the cost of insurance and an estimate for depreciation of the equipment. For the purposes of drawing up budgets these two items are estimated at 10% per annum. In practice, the insurance bills are paid and the remainder is kept in a contingency fund which is used to pay for equipment replacement and repairs.

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[9] See "The Interactive Cable Television System and Community Processes" in this volume.

The main reason for the low level of operating expenses is that there are no charges for space or for cable use. The NCC space in Kennedy Towers and Hensler Homes continues to be donated free, and since the NSF project withdrew, the Berks County Senior Citizens Council is no longer charging rent for Horizon Center. The cable company continues to provide office space, although somewhat reduced, for the production office and provides free maintenance of the return lines, free channel use, and all other technical support necessary. Since the programming now goes out over Channel 3, there is no need for special converters to receive the interactive programming one-way so all these costs are covered by the customers' subscriptions for cable. The cable company has enhanced its reputation as a community-minded station and has the benefits of contributing to a unique two-way programming service. Although the company has gained some additional cable subscriptions as a result of providing the two-way programming,[10] it is clear that the major value for the cable company is the investment in an innovative and exciting development of cable potential, in both technology and interactive service delivery. This may also help to give the company a competitive edge when they apply for new franchises, since they can provide concrete evidence of their contribution to the community.

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[10] One hundred seventeen homes were connected with converters; 91 already had cable subscriptions, and of the remaining 26 homes, 17 to continue to pay on their own when the experiment ended.

Replication of the Reading Operations

The main factor determining operations costs is the basic design of the system; in particular, the number of NCCs, the hours of origination, and the amount of additional equipment to be used. Thus, once the scale of the system is decided, there is not that much flexibility in the number of staff needed to keep it running. The major source of variation in operating costs is the extent to which the important cost items can be kept down. In staff costs, the use of volunteers is critical if a low monthly operating cost is to be maintained. However, it also turned out that there are government programs willing to subsidize salaries for such a service. The important non-staff cost items are the cost of cable and of space. In Reading, both these items are provided virtually free. In this section, the implications of the Reading experience in these three areas will be discussed in detail before presenting the estimated cost function in the last section.

Recommended Staffing and Volunteers

Table 2.3 outlines our recommended staffing for Phase I and II of the operations of an interactive system with three NCCs similar to the one in Reading. The staffing pattern is based on the recommendations outlined in the previous chapter. The recommendation assumes that the implementation staff would continue for the first phase of operations. Phase II represents our estimate of how the staff could be reduced to maintain normal operations along the lines

Table 2.3

Recommended Staffing For NCC Interactive System With Three Centers During Operations

Number	Position	Salary Base	Phase I		Phase II	
			Percent Time Employed	Total Monthly Cost	Percent Time Employed	Total Monthly Cost
	A. System Staff	$ p.a.	%	$	%	$
1	System Coordinator	15,000	100	1,250	100	1,250
1	Technical Director	12,000	100	1,000	---	---
1	Dir. of Programming	12,000	100	1,000	100	1,000
1	Switcher/Librarian	7,200	100	600	100	600
1	Secretary	6,000	100	500	100	600
1	Publicist	7,800	100	650	---	---
	For Mobile Unit					
1	Technical Aide	7,200	100	600	50	300
	B. Center Staff					
3	NCC Coordinators	8,400	100	2,100	---	---
3	Technical Aides	7,200	100	1,800	100*	1,800
3	Senior Aides	7,200	50	900	50	900
	For Additional Equipment at Center					
1	Technical Aide	7,200	50	300	50	300
	TOTAL			10,700		6,650
	FRINGE BENEFITS @ 10%			1,070		665
	TOTAL MONTHLY STAFF COSTS			11,770		7,315

ANNUAL ESTIMATED STAFF COSTS FOR REGULAR OPERATIONS: $87,780 experienced in Reading. The reductions are of two kinds: first, two full-time members of the system staff, the technical director and publicist, would be phased out; secondly, the NCC coordinators would go and all center staff would be part-time. If sufficient personnel resources exist in a community, as they did in Reading, it is possible to hire and train local citizens to run the system, with technical assistance initially provided by a professional staff. Senior aides from the implementation and the first phase of operations can be promoted to senior producers and work with the part-time technical aides at similar salaries. There is then room to hire additional senior aides during operations.

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*We recommend 6 persons at 50% rather than 3 at 100%: 3 as Technical Aides, 3 as Senior Producers; all with similar salary base.

So far, the implications of using volunteers have not been explored in any detail. The successful operation of a community-based interactive system depends upon the level of cooperation and involvement by local volunteers. In Reading, senior citizens were recruited both as paid staff members and as volunteers during the first phase of operations. Table 2.4 summarizes the participation of the elderly in running the system. Elderly volunteers helped to prepare and produce 47% of all segments during the first phase of operations; elderly staff were involved in only a few less. The economic value of the elderly contribution to interactive programming is included in the next chapter when the costs of producing an interactive segment are estimated. The tasks they performed covered the following:

1. Preparation of programming: the elderly planned specific programs, gathered information, recruited resource 'experts,' other presenters, and obtained materials and props.

Table 2.4

Numbers and Participation of Elderly in Reading Interactive System During First Phase of Operations

January 1976 - December 1976

	Number of Persons
As NCC Staff	
Total number of elderly hired as NCC staff	9
Total number of different elderly staff members who presented a segment	4
As Volunteers	
Total number of elderly volunteer participants in segment preparation	211*
Total number of different elderly volunteers who presented a segment	47
	Number of Segments
Segments in Which Elderly Participated	
Total number of segments which elderly staff helped prepare	274
Total number of segments which elderly volunteers helped prepare	159
Total number of segments for which elderly volunteers acted as support staff for presentation	248
Total number of segments which had one or more elderly presenters	248
Total number of segments which elderly volunteers helped to prepare or present	279
Total segments presented	595
Percent of total segments which elderly volunteers helped to prepare or produce	47%

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*This is the total number of times an elderly person worked to prepare a segment.

2. Program presentation: the elderly appeared on camera as hosts, guest experts, teachers, group activity leaders, panelists, and discussants.

3. Support staff for presentation: the elderly acted as on-site hosts, set up lights and equipment, operated camera or sound equipment, and helped to dismantle after the session ended.

4. Direction of the system: the elderly participated as members of two committees: the Program Committee and the Policy Board, in which they helped to direct and oversee the operation of the experimental system.[11]

5. Other activities: the elderly assisted in numerous other activities; for example, system publicity.

The crucial cost implication of this high level of participation in the operations of the interactive system is that the staff costs of operation would be considerably higher if the volunteer labor were valued at its market cost and the elderly staff were paid at their full market value. A system which is designed for the elderly can probably count on being able to keep staff costs down in this manner. Indeed, since the elderly presumably benefit individually and collectively from their participation, their contribution is to some degree one of the products of the interactive system. However, for others contemplating interactive systems for different groups, the higher real cost in terms of labor resources needed to operate may be more relevant, in which case these inputs would have to be valued at their market cost. By the same token, there may be other groups, such as schools, who could operate at even lower cost by involving even larger groups of volunteers.

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[11] For further details, see "Interactive Cable Television and Local Community Processes" in this volume.

The same logic applies to the involvement of agency personnel. More than seventy agencies participated in the programming. Twenty are regular users of the two-way cable and fifty have appeared on an occasional basis.[12] The economic value of the time inputs of service deliverers is included in the costs of interactive programming in the next chapter. Since the agency personnel are already paid a salary, this cost does not need to be calculated as part of the operations costs in the way that volunteer work might need to be. In this case, the service deliverers presumably make the decision that their time is as well, or even better, spent participating in the interactive system as in alternative ways of meeting agency goals. If they feel they can deliver services more efficiently over the interactive system, they will be willing to invest more time. Other sections of the final report deal with these questions in much greater detail. The section on community processes discusses the perceptions of the agency people on the relative merits of the interactive system. The section on the impact of the interactive system on the elderly covers a wide range of service impacts and the economic evaluation discusses the cost implications. It is worth noting, however, that the County Area Agency on Aging has paid for eleven interactive programming sessions at $500, which suggests that this system is already seen as a productive way to deliver some services.

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[12] Full details of agency participation can be found in "Interactive Cable Television and Local Community Processes" in this volume.

Cable and Space Costs

The two other important cost items which other system users would have to estimate are the costs of cable and space. In Reading, there is currently no charge for either. During the experimental period, the system paid the cable company for the cable subscriptions of the homes with converters and a fee for other services which included the maintenance of return lines and the production office space. Rent was also paid for space in Horizon Center. Since BCTV does not have to pay these charges now, they can be seen as a donation on the part of ATC's Berks Cable TV Co. and Berks County Senior Citizens Council to support the continuation of the interactive system. Others contemplating such systems may not be so fortunate and therefore need to consider their own circumstances to arrive at the appropriate cost of operations.

As long as there is a focus on service delivery and the public interest, it is unlikely that other systems would have to be concerned with leasing downstream channel time. If there is a cable system, it is required to have a public access channel to which the interactive system can be connected, where technically feasible. However, this does imply that there is a public channel available to home subscribers, a substantial penetration of the available market by the cable company, and finally, convenient time periods available on the public channel for programming. During the initial phase of operations, the programming was only available on closed circuit Channel G, because of research requirements. Programs could only be received in homes with the converter for which the experiment paid. It would therefore become a very expensive proposition to hook up home viewers, if they could only obtain the interactive programming in this way. Individual customers are unlikely to want to pay more than a minor installation fee for 1 to 2 hours of additional and rather specialized programming. Nevertheless, it is worth considering paying for such connections, particularly during an early experimental period, since it is one possibly feasible way of making the interactive programming available on a mass basis. Previously, we also recommended that any publicly-funded interactive system should consider paying the cable costs for specific housebound and institutionalized populations it wishes to service.

Similarly, as long as the interactive system is primarily concerned with providing services, it is quite likely that space can be provided free of charge by those who will gain from the service or who are responsible for providing the service. This is particularly true where the services have facilities of their own, as for instance Horizon Center and the residential homes for the elderly. Most institutional service providers should have available space; for instance, schools, hospitals, and community centers. However, it is important that the space be available for the exclusive use of the interactive system during the relevant hours. This may not always be so easy to arrange, as was discovered at Kennedy Towers.

Cost Function for Operation of an Interactive NCC System

Following the methodology used for estimating the cost function for installation and implementation costs earlier in the previous chapter, the cost function for operating costs is presented in this section. Two estimates are made; one for the first phase of operations and one for the second. The first phase represents the settling-in period, when the staff hired for installation and implementation continued to work on the development of programming and staff skills to carry on the system for regular operations. The same equations, salaries of staff and other cost estimates which were used for the installation and implementation estimates are used for these monthly operating estimates.

Table 2.5 contains the estimates made for Phase I and II with the variables and format used earlier. The following information can be calculated from these estimates:

Monthly Costs	Phase I	Phase II
Shared system costs	$6,632	$4,792
Cost per NCC	$2,002	1,232
Additional NCC equipment	341	341
Mobile unit	683	353

With three NCCs, the annual estimated total costs for Phase I are $163,944 and for Phase II are $110,184. The only difference between the two estimates is the number of staff and the percentage of time which some worked. Full details of the difference in staffing have already been presented in Table 2.3. Since Phase I took one year in Reading, the excess of Phase I operating costs over Phase II, which is $53,760, can be added to the total for installation and implementation to present a more accurate picture of what it would cost to get such a system operating on a regular basis. This adjusted total comes to approximately $235,000 with a regular operating budget of around $110,000 per annum.

Table 2.5

Estimated Monthly Costs for Phase I and Phase II of Operations for Reading Interactive System

	Phase I	Phase II
	$ per month	$ per month
I. BASIC SYSTEM COSTS		
A. Shared System Costs = C_1		
Equipment Maintenance	162	162
Cable	---	---
Space	195	195
Staff (including 10% fringe)	5,500	3,685
Miscellaneous	775	750
TOTAL SHARED BASIC	6,632	4,792
B. NCC Cost = C_2		
Equipment Maintenance	65	65
Cable Maintenance	137	137
Space	40	40
Staff (including 10% fringe)	1,760	990
TOTAL PER NCC	2,002	1,232
II. OPTIONAL VARIATIONS		
1. Additional NCC Equipment = C_3		
Equipment Maintenance	11	11
Staff (including 10% fringe)	330	330
TOTAL ADDITIONAL EQUIPMENT	341	341
2. Mobile Unit = C_4		
Equipment Maintenance	23	23
Staff (including 10% fringe)	660	330
TOTAL MOBILE UNIT	683	353

Making a similar adjustment to the actual Reading costs yields an installation and implementation cost of about $200,000 with current operating costs at $100,000 per annum.

Table 2.6 presents comparisons of monthly operating costs between the estimates for Phase I and II and the current BCTV budget. The major difference lies in an additional expenditure of $1,000 per month on staff. Equipment maintenance and miscellaneous costs are slightly higher for BCTV, but the estimates include a cost for cable maintenance which the ATC-Berks Cable TV Co. provides at no cost.

All these estimates are significantly lower than the true economic cost for the following reasons:

1. A significant portion of the manpower effort is provided by volunteer and low-cost senior participants.
2. No costs for downstream channel use are included.
3. No rentals for space usage are included. During Phase I, rentals were paid for Horizon Center and an estimated value of $220 per month can be placed on the production office space at the cable company's office. This would increase monthly operating costs by $620 and annual costs by $7,440. Similar rentals for the space at the other two centers would raise costs by another $800 a month or $9,600 per annum.

Table 2.6

Comparison of Monthly Estimated Costs for Phase I and Phase II Operations With BCTV by Major Category

	ESTIMATED COSTS		
	Phase I $ per month	Phase II $ per month	BCTV $ per month
Equipment Maintenance	391	391	569
Cable Maintenance	411	411	---
Space	315	315	319
Staff	11,770	7,315	6,457
Miscellaneous	775	750	938
TOTAL MONTHLY COSTS	$13,662	9,182	8,283
ANNUAL COSTS	$163,944	$110,184	$99,396

SUMMARY OF RECOMMENDATIONS AND MAJOR FINDINGS

A brief recapitulation of the major recommendations will serve as a summary of the major findings of relevance to those wishing to replicate the Reading system. Since the design of the system is fundamental to the staffing requirements and the costs, the design recommendations will be outlined first. Further details on staffing patterns, particularly the involvement of the elderly in program production and the increased efficiency of participants, and on the costs per hour and per participant hour by the different social service categories can be found in the section "Economic Evaluation of the Output of the Reading Interactive System."

These recommendations are made assuming that replicators are committed to the user controlled system of service delivery with the elderly as priority target participants. The system design ideas are developed from our collective judgment of the Reading experience. The staffing patterns and costs which are discussed are not those actually found in Reading but are based on the model described in the cost functions. The scale and prices incurred in Reading were used to generate the results presented here.

Recommendations for System Design

As a general principle, we would recommend starting with fewer centers and expanding as experience is gained and demands become apparent. It is crucial to have an active group of target participants at the outset of operations. Emphasis should be placed on recruiting and training them rather than on setting up more centers. These active participants are the basis for developing a self-generating system which provides programming designed by the users and responsive to the needs and interests of the target group.

Scale of the System

a) Number of sites: We recommend starting with no more than three NCC sites; this can be done with two permanent sites plus one mobile unit or with three permanent sites. These sites should be located in places to which a substantial number of the target population have access. The maximum number of permanent sites is 4 before more switching equipment becomes necessary.

b) Mobile unit: We strongly recommend investment and use of a mobile unit where there is sufficient existing two-way capability or where it can be easily and economically created. A mobile unit provides unique opportunities for originating from a variety of service delivery locations and can also be used to test the suitability of different sites and programming ideas at low cost.

c) One-way subscribers: We recommend connecting subscribers one-way. The survey results showed no adverse effects on participation in the centers. (The effect of extending the system on average costs is discussed in detail in Chapter 3 of the economic evaluation section.)

Programming

a) Hours of origination per day: We recommend starting with no more than one or two hours per day.

b) Program planning and production: We recommend concentrating on involving early participants in program planning and production and involving them from the start in such a way that, before too long, they can take over these functions entirely. We found that the elderly preferred this kind of involvement to the technical aspects and it became an effective way of recruiting candidates for staff members and volunteers.

Timing

a) Implementation: We recommend an eight-month installation and implementation period before the start of regular operations. Implementation includes such tasks as possible debugging, simulation, recruitment, training and initial program development prior to the opening of regular operations. (This recommendation presupposes a planning period during which the technical capacity is ascertained and the relationships with the cable company and community organizations are established.)

b) Operation: We recommend keeping the implementation staff for at least one year before removing the outside professionals and reducing the local staff to regular operating strength.

Recommendations for Staffing

Staffing for Implementation and the First Year of Operations

a) Professional staff: We recommend hiring the following:

1. Director of Implementation (half-time)
2. System Coordinator (full-time)
3. Technical Director (full-time)
4. Program Developer (full-time)
5. Publicist (part-time).

The first three should have technical skills, The program developer does not require such skills and can be recruited locally. However, it is important that this position be filled by someone familiar with the local community and professionally experienced with the service needs and interests of the target population. The program developer would be responsible for recruiting local staff as well as both paid and volunteer participants, for developing relations with the service agencies, and for the initial program planning. The publicist can also be hired locally and is needed to promote the system during the last few months of implementation and early months of operation.

b) Local staff: We recommend recruiting and training the following from the local community:

1. NCC Coordinators (one for each center)
2. Senior Aides (at least one for each center)
3. Technical Aides (at least one for each center, one as switcher/librarian, and one extra for the mobile unit).

We recommend hiring technical aides with some technical aptitude and providing a more intense technical training for them. In our experience, the elderly were not especially interested in the technical operations, but considerable planning was necessary to recruit and train both paid aides and volunteers. This is the primary responsibility of the NCC coordinators.

c) Agency personnel: We recommend that the system coordinator and program developer be responsible for the initial contacts with officials and staff of the relevant service agencies. While it is critical to involve the social service deliverers from the beginning, it is important that they do not take over program planning since their perceptions are not always accurate on the service needs and interests of the target group.

Staffing for Regular Operations

a) Professional staff: We have found it is possible to withdraw all the original professional staff after the first year of operation. We recommend making arrangements for occasional technical assistance. In Reading, the cable company provides the necessary maintenance and continuing support.

b) Local staff: The staff trained locally has been able to take over the operation. We recommend promoting the trained staff to take over the system operation and the senior aides to take over the operation of the centers as well as the program production, planning and presentation. We recommend using the technical aides part-time.

Costs of the Recommended System

Installation and Implementation Costs

The total cost of the eight-month implementation period and the extra costs of operating the system during its first year constitute the initial investment in the system. For a three-NCC system originating two hours of programming a day with the staffing recommended, this total cost comes to $235,000 using the salaries and other costs incurred in Reading. The major items of expense are:

1. Cost of Equipment

   The total for all production office, NCC, mobile unit and extra equipment is $73,000. This figure would vary if more or fewer centers were established and if the technical configurations required more or less switching equipment. The equipment cost per center is $10,000.

2. Cost of Cable

   There are no fees for downstream cable included in these estimates, but the costs of installing the cable for return lines, maintaining these cables and installing converters are included; they total $15,000.

3. Staff

The estimated manpower costs for the eight-month implementation period are $78,000. The implementation staff kept on for the first year of operations cost $53,000 above the regular operating costs.

These estimates may be lower than others would incur for the following reasons:

1. No downstream cable fee is included.
2. No rentals for space are included.
3. There is a substantial input of volunteer work in the operation of centers and program production.

Any systems which had to pay for these items would cost more.

Operating Costs

The cost of operating the recommended system on a regular basis is estimated at $110,000 per annum. This estimate includes no charge for downstream cable or for space. It does include an estimate for equipment and cable maintenance. The major item is for staff at $87,000; this is more than three quarters of the total budget. It represents a considerable reduction from the implementation staff costs. The recommended staff consists of:

1. System Coordinator (full-time)
2. Director of Programming (full-time)
3. Switcher/Librarian (full-time)
4. Secretary (full-time)
5. 5 Technical Aides (part-time)
6. 3 Senior Producers (part-time)
7. 3 Senior Aides (part-time).

The reduction in staff is possible both because training is completed and because all participants, NCC staff, agency staff, and the elderly, increased their efficiency of operation. More details and an analysis of the increased efficiency are presented in the section "Economic Evaluation of the Output of the Reading Interactive System."

APPENDIX A

Calendar of Implementation

May 1975	Production office set up (director of implementation, system coordinator, and technical director) Equipment and tape ordered Supplies ordered Accounting procedures organized Seminars on implementation for research staff Presentations about experiment to: Social service agencies Municipal agencies Educational institutions Senior citizens clubs and organizations NCC space prepared (e.g., painting, lighting, telephone, furniture, etc.).
June 1975	Local staff hired (NCC coordinators, switcher/librarian, secretary) Training of NCC coordinators started (for curriculum see Appendix B) Head-end and NCC equipment installation started.
July 1975	Training of NCC coordinators continued Installation of equipment continued Informed meetings with senior citizen groups.
August 1975	NCC Coordinators start recruiting seniors to participate with view to identifying and training aides and volunteers Equipment installed at Horizon Center Technical tests of the systems.
September 1975	Participant demonstration between 3 centers and head end Technical aides hired and trained Technical tests and refinements continued.
October 1975	Program testing begun Technical tests and refinements continued.

APPENDIX A

(cont'd)

November 1975	Agency personnel recruited and trained at NCCs Program experimentation Technical configurations tested.
December 1975	Agency personnel recruitment and training continued Program experimentation.

APPENDIX B

Curriculum for Training NCC Coordinators: June 1 to July 31, 1975.

(5 days a week -- 8 hours a day)

WEEK 1	Conceptual overview: includes approach sections of Access Workbook, Vol I*; implementation design and research goals; discussions on relationships to seniors, agencies, etc.
WEEK II	Hands-on training, portapak: Access Workbook Vol. II;* shooting, viewing of tapes, basic maintenance.
WEEK III	Installation of the studio: coordinators work with the installers in order to understand how the technical configuration of each NCC was set up.
WEEK IV	How to teach the portapak: the connection between people and technology; the environment of the NCC; the role of the coordinator in creating and maintaining that environment.
WEEK V	Internal multiple camera and sound; production and lighting.
WEEK VI	Production, graphics, slides, visual aids, production values.
WEEK VII	The system: overall system requirements; sound, lighting, switching, inner-connected multiple camera switching.
WEEK VIII	Review.

* Published by the Alternate Media Center, School of the Arts, New York University, 1974.

APPENDIX C

Breakdown of Equipment Costs

A. Production Equipment

This includes editing equipment, portable production equipment, and back-up equipment for the NCCs. It is stored at the production office. Costs for all equipment are the prices actually paid, not list price. The number of shared portapaks would be sensitive to the amount of anticipated programming which is to be produced in this manner. For a large NCC system with many system users shooting tapes, the number might be greater than three, conversely a system could get by with two shared portapaks.

Number of Units	Name of Item	Cost
1	3/4" video cassette recorder	$ 1,147.25
1	3600 editing machine	896.00
1	3650 editing machine	1,150.00
3	9" Sony monitors @ $212.00	636.00
3	Portapaks with cameras @ $1,570.00	4,710.00
2	Back up studio VF cameras @ $620.00	1,240.00
1	Hitachi audio cassette machine	45.00
	TOTAL	$ 9,824.25

B. Head-End Equipment

This equipment is variable depending on the facilities and equipment which the cable system has and will provide. If more than four sites are to interact at the same time, the cost for the SEG would increase as the one in Reading had only four inputs.

2	Shure mixers @ $119.60	$ 239.20
1	Special Effects Generator @ $722.25	722.25
6	Sony 11" monitor receivers @ $265.00	1,590.00
1	Character generator @ $1,500.00	1,500.00
1	Videocassette recorder w/tuner @ $1,360.00	1,360.00
1	Cartridge tape machine @ $50.00	50.00

APPENDIX C
(cont'd)

Number of Units	Name of Item	Cost
1	Spectrum analyser @ $2,390.00	2,390.00
1	Modulator to feed Ch. 3 @ $1,361.00	1,361.00
1	Jackfield panel @ $75.00	75.00
1	Turntable @ $75.00	75.00
1	Uni-directional microphone @ $15.00	15.00
	TOTAL	$ 9,377.45

C. Portable Equipment

This is the equipment for a mobile unit.

1	RF adapter	$ 76.50
1	Battery	110.00
1	Tripod	72.00
1	Special Effects Generator	722.25
2	Lavalier microphones @ $52.80	105.60
2	Monitors @ $212.00	424.00
1	Modulator (AMUT for ch. 6)	450.00
1	Mike mixer	119.60
3	Lowell light stands @ $134.40	403.20
1	CMA II	100.00
1	Portapak camera (from portapak-shared production equipment)	
1	Uni-directional microphone	80.00
1	Omni-directional microphone	41.50
1	Tool box	100.00
	TOTAL	$ 2,804.65

D. NCC Equipment

This is the equipment for transmitting and receiving interactive programming and includes cameras, monitors, and TV receiving equipment, audio transmitting and receiving, RF transmitting equipment, playback and production equipment. The equipment listed is for one center; the Reading system purchased three sets of NCC equipment.

APPENDIX C
(cont'd)

Number of Units	Name of Item	Cost
1	GBC Studio VF camera	620.00
1	Tamron Fl. 8, 10-1 zoom lens	$ 1,000.00
1	CMA II camera adaptor	100.00
1	50' camera cable	43.00
2	GBC tripods (studio & dollies) @ $165.00	330.00
1	Genlock IA Special Effects Generator	722.25
1	9" Sony monitor	212.00
1	Rack mount with three 5" monitors	729.00
2	Setchell Carlson monitors (23") @ $289.00	578.00
1	9" Monitor for tape playback	212.00
1	9" Monitor for line	212.00
1	Oak converter	60.00
1	Shure audio mixer	119.60
1	Feedback stabilizer	83.60
1	Sanyo amplifier	40.00
1	Jensen speaker	26.00
2	Microphone desk stands @ $3.00	6.00
2	Microphone floor stands @ $8.75	17.50
4	RE II microphones @ $80.00	320.00
1	Shure Lavalier microphones	52.80
1	Modulator	450.00
2	Lowell light kits @ $134.40	268.80
2	Smith victor scoops @ $65.00	130.00
1	Modular control console	365.00
1	RF adaptor	75.50
1	1/2" playback deck (3650)	1,150.00
2	Bretford carts @ $65.00	130.00
1	Portapak with cameras	1,570.00
2	Batteries @ $110.00	220.00
1	32' camera cable	65.50
1	Tripod	72.00
1	Tool kit	150.00
2	Weaver strips @ $15.00	30.00
1	Audio cassette machine	45.00
	TOTAL	$10,205.55

E. Additional NCC Equipment

One of the three NCC sites in Reading was larger and more extensively equipped than the other two. The extra equipment permitted this NCC site to accommodate larger groups of participants and also the transmission of graphics for the NCC system. The Horizon Center had the extra equipment.

APPENDIX C
(cont'd)

Number of Units	Name of Item	Cost
1	Graphics camera with lens	$ 670.00
1	Extra Shure audio mixer	119.60
2	Extra microphone desk stands @ $3.00	6.00
2	Extra RE II microphones @ $80.00	160.00
1	Extra Smith victor scoop	65.00
1	Extra Jensen speaker	26.00
1	Extra Setchell Carlson (23") monitor	289.00
	TOTAL	$ 1,335.60

A BCTV Financial Statements, Budget and Projected Income

BCTV
Berks Community Television
A NON-PROFIT ORGANIZATION

APPENDIX D

October 17, 1977

Mitchell L. Moss, Principal Investigator
NYU/Reading Consortium
87 West Third Street
New York, New York 10012

Dear Mitchell,

Enclosed are copies of BCTV's financial statements, budget, and projected income for the next twelve months which you requested in your October 4 letter. I assume that the transfer will include office as well as technical equipment.

If you need any additional information, please let me know.

Sincerely,

Jerry Richter
Executive Director

GJR:ch

cc: Red Burns

Enclosure

c/o Horizon Center, 40 N. 9th St., Reading, Pa. 19601, (215) 374-3065

BERKS COMMUNITY TELEVISION - OPERATING BUDGET - NOVEMBER 1977 - OCTOBER 1978

# of PERSONS	STAFFING	MONTHLY SALARY	PERCENTAGE OF TIME	ANNUAL SALARY
1	Executive Director	$1,000.00 (11/77) 1,100.00 (12/77-10/78)	100%	$13,100.00
1	Production/Program Director	888.00 (11/77) 988.00 (12/77-10/78)	100%	11,756.00
1	*Production Assistant	650.00	100%	7,800.00
1	*Technician III	487.50	100%	5,850.00
1	*Secretary/Bookkeeper	568.75	100%	6,825.00
2	Technician I	758.00	50%	9,096.00
1	Technician III	227.50	50%	2,730.00
1	Senior Producer	325.00	50%	3,900.00
2	*Senior Producers	433.00	50%	5,200.00
3	Senior Aides	350.00	50%	4,200.00
1	*Senior Aide	217.00	50%	2,600.00
1	Publicist	130.00	25%	1,560.00
	TOTAL STAFFING			$74,617.00

STAFF BENEFITS		MONTHLY	PERCENTAGE	ANNUAL
F.I.C.A.	(on $51,209.00)	$250.00	5.85%	$2,996.00
Health Insurance	($21.75 X 3)	65.25		783.00
PA. Unemp. Tax	(2% of 1st $4,200)	82.66		992.00
Workman's Comp.		31.00		373.00
Total Staff Benefits				$ 5,144.00
Total Staff and Benefits				$79,761.00

* - Indicates supported salary

BERKS COMMUNITY TELEVISION - OPERATING BUDGET - NOVEMBER 1977 - OCTOBER 1978

OPERATING EXPENSES	MONTHLY	PERCENTAGE	ANNUAL
Printing and Advertising	$ 80.00		$ 960.00
Postage and UPS	88.00		1,056.00
Stationary - Office Supplies	75.00		900.00
Program Supplies	35.00		420.00
Telephone (PI Line Head End 4 Office Phones Long Distance)	279.00		3,348.00
Staff Travel	100.00		1,200.00
Sundry Equipment Items	40.00		480.00
Equipment Maintenance	529.00		6,348.00
Professional Fees	200.00		2,400.00
Petty Cash	10.00		120.00
Typewriter Rental	40.00		480.00
Videotape	350.00		4,200.00
		Total Operating Expenses	$ 21,912.00
		Total Operating Budget Costs	$101,673.00

PROJECTED INCOME - 11/77 - 10/78

A. Committed

1.	NSF/NYU Continuation	$15,965.68
2.	Office of the Aging	5,988.90
3.	PCHIP	1,548.86
4.	National Endowment for the Arts	18,254.00
5.	Supported Salaries and Benefits (CETA/AARP)	30,478.00
6.	Receivable from Federal Government (S/S overpayment)	1,400.00
	Total Committed Income	$73,635.44

B. Projected Income

1.	PCHIP - Public Policy Series	$ 14,125.00
2.	PCHIP - Special Project Series	14,144.00
3.	City of Reading	15,600.00
4.	NAA Tax Credit Available	30,000.00
	Total Income Expected	$ 73,869.00
	Total Income Committed and Expected 11/77 - 10/78	$147,504.44

APPENDIX D

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BERKS COMMUNITY TELEVISION

READING, PENNSYLVANIA

REPORT OF EXAMINATION

JULY 31, 1977

* * * * * *

LaMANNA ASSOCIATES
CERTIFIED PUBLIC ACCOUNTANTS

1733 PENN AVENUE, WYOMISSING HILLS, PA.
215-678-4126

The Board of Directors
Berks Community Television

We have examined the Balance Sheet of BERKS COMMUNITY TELEVISION as of July 31, 1977 and the related Statement of Receipts and Expenditures for the period August 6, 1976 thru July 31, 1977. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, such financial statements present fairly the financial position of BERKS COMMUNITY TELEVISION at July 31, 1977 and the results of its operations for the period August 6, 1976 thru July 31, 1977, in conformity with generally accepted accounting principles.

LaMANNA ASSOCIATES

La Manna Associates

August 25, 1977

BERKS COMMUNITY TELEVISION
READING, PENNSYLVANIA
BALANCE SHEET
JULY 31, 1977

ASSETS

Cash	$ 13,868
Cash - Restricted	1,789
Receivable from Federal Government	1,400
ASSETS	$ 17,057

LIABILITIES

Payroll Taxes Payable	$ 58

EQUITY

For the Period Ended July 31, 1977	16,999
LIABILITIES AND EQUITY	$ 17,057

The accompanying notes are an integral part of these financial statements.

BERKS COMMUNITY TELEVISION
READING, PENNSYLVANIA
STATEMENT OF REVENUES AND EXPENDITURES
FOR THE PERIOD AUGUST 6, 1976 THRU JULY 31, 1977

REVENUES	
Donations	$ 45,306
PCHIP Grant	10,068
Interest Income	289
REVENUES	55,663
EXPENDITURES	
Payroll	31,071
Payroll Taxes	1,103
Employee Health	435
Telephone	1,477
Printing and Advertising	1,052
Professional Fees	856
Tape	487
Office Supplies	460
Insurance	420
Travel	410
Postage	406
Equipment	237
Miscellaneous	149
Program Supplies	101
EXPENDITURES	38,664
Excess of Revenues Over Expenditures	$ 16,999

The accompanying notes are an integral part of these financial statements.

BERKS COMMUNITY TELEVISION
READING, PENNSYLVANIA
NOTES TO FINANCIAL STATEMENTS
JULY 31, 1977

BASIS OF ACCOUNTING

A modified accrual basis of accounting is followed; Donations and grants are recorded when received.

ORGANIZATION

Berks Community Television was incorporated on August 6, 1976. It is a non-profit organization and is exempt from federal income tax under Section 501(c)(3) of the Internal Revenue Code. The organization's first receipts were in November 1976 and its initial expenditures in March 1977.

CASH - RESTRICTED

The organization was awarded a grant by the Public Committee for the Humanities in Pennsylvania (PCHIP) in the amount of $15,488 of which $10,068 had been received as of July 31, 1977. Under the grant agreement, grant funds must be used only for authorized purposes and any unexpended grant funds must be returned to PCHIP at the conclusion of the project.

RECEIVABLE FROM FEDERAL GOVERNMENT

The organization is not liable for social security and federal unemployment taxes. The receivable represents an estimate of a refund to be requested from the Federal Government for prior payments of such taxes.

5. BCTV Rate Schedule

BCTV
Berks Community Television
A NON-PROFIT ORGANIZATION

APPENDIX E

November 21, 1977

MEMORANDUM

TO: Board Members

FROM: Jerry Richter

RE: Rate Schedule

The following suggested rate schedule reflects those services which the BCTV staff is most often called upon to perform for individuals and organizations. I would recommend that, if approved, these rates be imposed with discretion. However, I feel these are low enough to be paid by almost all those who request such services rather than by the few who could afford to pay more.

1. Program Time-Interactive System--includes 2 below
   $300.00 half hour
   $500.00 one hour

2. Taping (porta-pac) except when program time paid
   $25.00 per hour, one person. Includes planning time (meetings, etc.)
   $15.00 additional person per hour
   .15 per mile travel
   Cost of tape and 50% overhead

3. Dub (video or audio)
   $15.00 per hour
   Cost of tape and 50% overhead

4. Edit Preparation
   $25.00 per hour

5. Edit
   $45.00
   Cost of tape and 50% overhead

6. Tape Screening
   $25.00 per hour
   .15 per mile travel

7. Tape replay
   $50.00 per 30 minute

All time charges are computed on a portal to portal basis from the BCTV production office as is mileage.

GJR:ch

c/o Horizon Center, 40 N. 9th St., Reading, Pa. 19601, (215) 374-3065

APPENDIX F

Job Descriptions

1. Administrative

Executive Director

Is responsible to and answers to the board of directors of BCTV. The primary responsibility of the executive director is to implement policy as determined by the board. Other duties include:

- Initiating programming ideas for consideration of board.
- Coordinating programs at board's request.
- Acting as liaison with Berks Cable TV.
- Responsible for staff and operations.
- Responsible for public relations.
- Responsible for developing funding configurations, including writing and preparing grant proposals.

Program Development Director

Is under the supervision of the executive director. Responsibilities include:

- Coordinating program ideas from the programming committee and community groups.
- Contacting resource people or agencies and setting date and time of program.
- Assigning hosts at originating center and other NCC's.
- Preparing monthly program schedule.
- Preparing session outlines.
- Assigning and briefing the system hosts.
- Developing program format.
- Supervising and scheduling of pre-production planning.
- Responsible for overall downstream picture. Troubleshoots with technicians to locate and clarify technical problems.

2. Office

Secretary/Bookkeeper

Is under the supervision of the executive director and is responsible for

- Cash disbursements and payroll.
- Maintaining all accounting records for all grants.
- Overseeing management/general office functions.
- Assists executive director in administrative functions as required.

Job Descriptions

Publicist

Is under the supervision of the executive director and is responsible for:

- Setting up logs and guidelines for information to be gathered for subsequent dissemination.
- Supervising all printing and publication of material.
- Weekly writing and printing of program schedule.
- Acting as a liaison with local media.
- Responsible for writing articles to appear in pertinent publications.

3. Technical

Technician III

Responsible to the Technician II in charge of the NCC. Requirements include:

- Camera operation.
- Ability to physically set up an NCC for an interactive program.
- Knowledge of lighting set-up.
- Ability to switch internally under the direction of the Technician II.
- Ability to use portable tape equipment.

Technician II

Responsible to the Program Development Director. Requirements include those of Technician III plus:

- Ability to orginate from any NCC or remote location.
- Ability to perform minor equipment maintenance (make and repair all necessary cables, clean tape decks, etc.).
- Ability to switch internally between live, graphic and tape not only mechanically but also conceptually.
- Ability to conceptualize and arrange production of tapes.

Technician I

Responsible to the Program Development Director. Requirements include those of Technician II and III plus:

- Ability to switch at the head end.

4. Production

Senior Producer

Works under the supervision of Program Development Director and is responsible for:

APPENDIX F

(Cont'd.)

Job Descriptions

4. Production

Senior Producers

Works under the supervision of Program Development Director and is responsible for:

- System hosting.
- Researching programming possibilities.
- Procuring presenters for specific programs and on-camera hosting of these programs.
- Planning format in conjunction with Program Development Director.
- Keep Program Development Director informed about planning status of all programming.

Senior Aide

Works under supervision of technician in charge of location and is responsible for (where applicable):

- Greeting people at door.
- Seating participants.
- Assisting with miking.
- Calling people for particular programs.
- Answering telephones at NCC's or head end during program.
- System and program hosting.

INTERACTIVE TELEVISION:
A FRAME ANALYSIS

by

John Carey

INTERACTIVE TELEVISION: A FRAME ANALYSIS*

Introduction

This paper examines the frame characteristics of an interactive cable television system for senior citizens in Reading, Pennsylvania. Frame analysis treats a telecommunication system as a unit of social activity and attempts to uncover those structural characteristics which distinguish it from other social activities. A central issue in communication research is whether to regard interactive television as a form of face-to-face interaction; a modified version of one-way commercial television; or as a distinct communication frame. To study this, I attempted to map some of the ways in which the interactive television system in Reading conveys information, regulates behavior, and constructs boundaries around frame activity. These patterns are set against patterns in one-way commercial television and everyday life situations. I also sought to determine if the interactive television system in Reading is a consistent frame of activity for users, and how they learn to use the system.

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*I am grateful to Ray Birdwhistell, Erving Goffman, and Ben Park for their critical comments.

A Brief Outline of the System

The interactive television system in Reading, Pennsylvania consists of three neighborhood communication centers located in different parts of the city. Kennedy and Hensler are located in housing complexes for senior citizens and Horizon is in a community center for seniors. In addition, a number of remote locations may be linked into the system (e.g., City Hall, local high schools, and the local office of the Social Security Administration). All of these units are linked to a "head-end" switching center in a separate location. The programming is cablecast to all cable subscribers in Reading, as well as the centers, for two hours each weekday.[1]

The system is interactive in the sense that participants in each of the three centers (and any remote center which is linked into the system) communicate and interact with participants in other centers via a television link. Also, home viewers may interact (audio only) with any of the centers by calling on the telephone, while the switcher at the head end links them into the system. The head-end switcher may also speak on the system to regulate the interaction, make a technical comment, or participate in a social exchange. However, he cannot be seen by anyone in the centers or the private homes.

Programs on the Reading system vary in length from five minutes to one hour. There are also a number of "commercials," one minute in length or shorter, which convey information about social services, provide health tips, etc. Nearly all programming is live. Most spot announcements, however, are pre-recorded and played during programs, or at a break between programs.

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[1] During part of the experimental period, there was only one hour of programming per day. Also, prior to September 1976, only a selected group of 117 households in Reading received the signal.

Program hosts and participants in the centers are seniors almost exclusively. (Here, seniors may be defined functionally as those who live in housing for senior citizens or attend a community center for "seniors." Nearly all are over 60, and most are 65 or over.) Guests on the programs consist of many non-seniors, as well as seniors. It is difficult to determine the age of home-viewer callers, but their voice quality and the content of questions suggest that most are seniors. The technicians who operate the system (e.g., one camera operator in each center, the head-end switcher, etc.) are predominantly non-seniors.

Methodology

Data for this report was drawn from three sources:

1. On-site observations at the three neighborhood communication centers in Reading, and the head-end switching center.
2. Unstructured observation of approximately 100 hours of video tapes of programming, covering the period from June 1975 to December 1976.
3. Detailed, systematic notation of selected behavioral patterns and visual structure in a sample of tapes from January 1976 to December 1976. The sample consisted of one hour of programming per week. The days of the week were randomly ordered, then sampled week by week, i.e., Tuesday from the first week, Thursday from the next week, and so on, over the course of a year.

The notation methods and analytic categories are adapted from Birdwhistell[2] and Goffman.[3] However, I offer the usual caveat that the aforementioned are not responsible for any errors in the design and analysis.

The Frame

The term "frame," as used here, is taken from Goffman[4] and Bateson.[5] It is a unit of social activity. Thus, a picnic, a baseball game, and activity in a grocery market may all be treated as frames. The analyst who examines frames is typically concerned with: how one frame differs from another; what are the patterns of organization for frame activity; and what are the rules which govern interaction within a given frame.

In this paper, I will be concerned with describing some of the ways in which interactive television differs from one-way commercial television and face-to-face interaction. Also, organizational frame issues such as how programs open and close will be considered as well as interaction issues such as how a participant gets to speak in the system.

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[2] See: Ray Birdwhistell. Kinesics and Context. University of Pennsylvania Press, 1970, pp. 65-98.

[3] Erving Goffman. Frame Analysis. Harper and Row, 1974, pp. 1-39.

[4] Ibid.

[5] Gregory Bateson. "A Theory of Play and Fantasy." in Psychiatric Research Reports 2, American Psychiatric Association, December 1955, pp. 39-51.

In order for a frame to exist, an information state for participants engaged in that social activity (or frame) must be built and maintained. An information state is the knowledge and assumptions a person has in relation to a situation. Our information state tells us to apply a particular frame to the activity we are either engaged in or observing. Therefore, it would lead us to think that children engaged in vigorous activity are "playing" or "fighting," or that two people engaged in talk are "having a conversation" or "participating in a sales encounter." Based on our information state, we apply a frame to activity, and behave in relation to frame rules, as we understand them. As the examples just cited illustrate, frames are not always clear for an observer or participants. When a man and woman are talking, one of them may view the activity as a conversation while the other may view it as courting. Thus, people may apply different frames to the same situation. This is a central issue in the Reading television system: does it comprise a single, consistent frame of activity for participants?

Closely linked to the issue of frame differences is the problem of communication code differences. A movie about gangsters is a different frame than the real activity of gangsters. But are the speech behavior, the gesture system, and other communication behaviors of an actor playing the part of a gangster systematically different from the speech behavior, gesture system, etc., of a real gangster? Similarly, one might assume that activity in a bar operates within a different frame than activity in a beauty parlor. Yet the code which governs how participants take turns to speak might be the same in both situations. Code behavior within a frame may be governed by the specific characteristics of that frame, or it may be governed by a broader frame that encompasses many activities.

Information State Issues in the Reading System

In the Reading interactive television system, the monitor plays a crucial role in building and maintaining the information state of participants. Basically, the monitor is a television set. There will usually be several monitors in the control room of commercial television studios: one for each camera in operation. One monitor shows the picture that is being broadcast or recorded; others are for previewing optical effects, viewing pre-recorded material, etc. Also, in a commercial television environment, there will be one or more monitors in the studio where the performers and audience are situated. Typically, these show only the selected signal, i.e., the picture that is being recorded for broadcast. Further, the studio monitors are generally off to the side. They are not in the direct view of performers on stage, but can be seen by the audience.

In the Reading system, the monitor is in clear view of everyone--hosts, guests, and participants. Moreover, it serves a very different function than the commercial television monitors. Like the commercial television monitor, the Reading studio monitors convey what is officially "on" throughout the system. That is, they tell participants in a given center if they are being seen by the other centers and home viewers. But it is also the channel through which a participant in one center may interact (i.e., speak to, hear, see, and be seen) with participants in other centers. And over time, it has become a principal channel through which participants in the same center communicate. That is, in many interactions within the same center, one person speaks to another by speaking to the monitor. The other person, although in the same physical space, responds to the monitor. This can occur even when participants are seated side-by-side.

Thus, the monitor is a crucial link in telling people who they are interacting with; where the other person is; and what information is being transmitted throughout the system. For all these reasons, as well as some I will discuss shortly, nearly everyone in the Reading system, hosts, guests, and participants, looks at the monitor nearly all the time. The information state of those who use the system, about the name of a program, the location of what they're seeing, etc., is maintained by a variety of additional instruments.

First, a character generator, which is operated by the switcher at the head end, can superimpose typographic information on the screen. In the sampled tapes, the character generator was used at a mean rate of 3.0 times per hour. It provided information about phone numbers which viewers could call, the address of a social service agency, etc. It is also a channel through which the switcher at the head end can communicate to viewers and participants. For example, when a participant extended a verbal greeting to the switcher, he answered via the character generator. The character generator may impose typographic information on a black screen with no picture, or over a picture (typically, at the bottom of the picture.) A graphics camera operated at Horizon Center, can display pictures, posters, charts, etc. In the sampled tapes, the graphics camera was employed 6.7 times per hour, mostly to display a card which told the name of a program, or to show photos that were talked about in the programming.

In addition, a number of hosts regulate the information state of those who use the system. A program host, center host, or system host can provide verbal information. Generally, each program has a host. The host may interview a guest or someone who is presenting information. The host may also be the presenter. In addition, each center has a host, and at the beginning of the day, there is a system host who opens the day's programming. Most often, the host is a clearly designated person. However, sometimes it is a role which one of the participants will fill. In any of these configurations, the host provides information about the name of a person who is about to speak, the phone number where viewers may call in order to speak, the name of the program, etc.

The host performs a number of additional functions vis-a-vis the information state of participants, for example:

1. Conveying information from back channels, e.g., the host conveys information from a technician who is off-camera and off-mike. The host also conveys information from other points in time, e.g., "Before the show, there was a conversation going on here about...."

2. Relaying information and comments said off-mike by a participant. If a participant says something for the group, but it is not picked up by a microphone, the host in that

center will relay it to the group by repeating the comment into a microphone.

3. Filling in background information for something which has been said. For example, in one program, "Singalong," a woman mentioned "winning the prize" the previous day. The host-presenter followed this comment with information that the prize was won on "Sense and Nonsense," a quiz program.

4. Replaying events and comments. For example, while someone in one center has the floor, a remark may be uttered in another center, off-mike, for the local group. Later, the host may replay the remark by repeating it on-mike for the entire system.

5. Announcing topics under discussion and changes in topic during a program. Since people are free to walk into a center during programs and home viewers can tune in anytime, there is a need for someone to maintain the information state about things which are obvious to people who have been participating or watching from the beginning.

6. Signaling programming transitions. The host opens and closes programs and cues people just before and after a pre-taped spot announcement is shown. A conventionalized set of verbal cues has developed for these transitions. After a pre-taped spot, for example, the program host will typically say, "Good morning again," "O.K." (with a rising intonation) or "Thank you." I might add that a set of visual conventions supplements this information about program transitions. A card on the graphics camera states, "And now a message" before spots, and the conclusion of a spot is faded out (i.e., the picture goes to black) by the switcher at the head end.

It is not clear whether ordinary people in the centers and private homes make a distinction between the "host" and the other "participants." The program host is likely to be recognized as someone with a special status, but the system host and center hosts are probably perceived as ordinary participants (which they are, most of the time). Nevertheless, in the absence of a host to build and maintain the information state of participants, or a person in one of the centers who assumes this role, there is likely to be confusion about what is happening, and what will happen next. The host's function is vital to the operation of the system.

Regulating Interaction

In regulating interaction among participants, hosts, and guests, the monitor once again serves a crucial role. The presentation of behavior on the monitor is a reality to which everyone relates. Thus, the monitor's presentation of a person or action often appears to be a more powerful determinant of social outcomes than the face-to-face presentation. That is, how someone appears on the monitor is more likely to determine whether their performance is judged as "good," or whether someone wearing a new dress will receive a compliment on the air, than how they appear to someone who can see them face-to-face.

This is rather obvious in center-to-center interactions. In these instances, the way a monitor presents a person is the only alternative available. However, as I noted earlier, the monitor orientation is so strong that people in the same center also use it to communicate with each other. Two people seated side-by-side often interact by speaking to the monitor and answering to the monitor. At some point, they may look at each other, but their primary orientation will be toward the monitor.

The pattern of seating in each of the centers helps to foster a monitor orientation by participants, hosts, and guests. Though seating patterns vary from center to center, in each case all seats face toward the monitor. Further, the camera (there is only one camera

FIGURE 1
TYPICAL SEATING CONFIGURATION IN A READING NEIGHBORHOOD COMMUNICATION CENTER

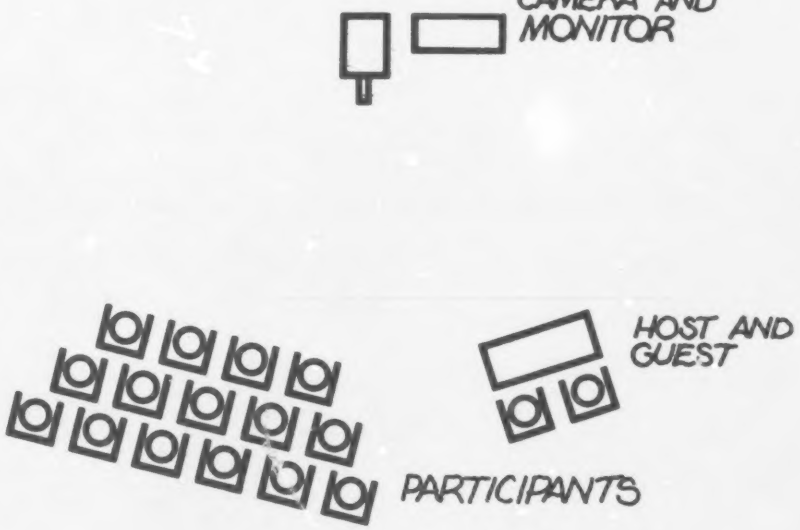
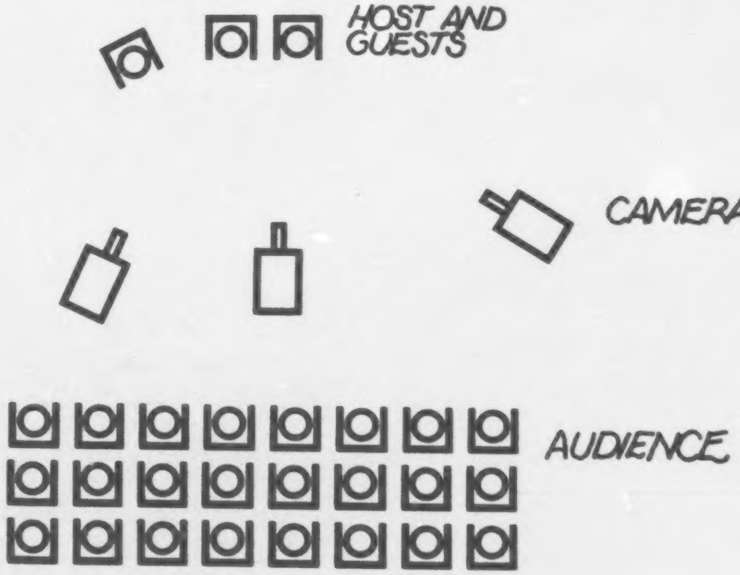

CAMERA AND MONITOR
HOST AND GUEST
PARTICIPANTS

FIGURE 2
TYPICAL SEATING CONFIGURATION IN A COMMERCIAL TELEVISION STUDIO


HOST AND GUESTS
CAMERAS
AUDIENCE

in each center - with a few, rare exceptions) is located next to the monitor. So, the way people present themselves to the monitor is very close to the way the camera records them. The seating arrangements and camera-monitor placement thereby orient participants toward the other centers. Interactions within a center have adapted to, or utilized, this center-to-center orientation. Thus, participants, guests, and hosts look at and talk to the monitor most of the time - whether they are interacting with someone in another center or their own center.

In addition, the camera operators often use the television monitor on the studio floor for focusing and framing shots. They use the floor monitor in place of, or as a supplement to their camera monitor (i.e., a small monitor built directly on top of the camera.) Further, presenters and guests often use the TV monitor as a substitute for direct visual observation in the same room. For example, one woman who was demonstrating floral arrangements looked at the monitor to see if the flowers were straight rather than look directly at the flowers in front of her.

Similarly, if guests or participants are asked a question by someone seated behind them, they do not, typically, turn around. Rather, they watch the monitor to see the person who is asking the question, then answer to the monitor. The questioner, in return, sees the answer by viewing the monitor. This is somewhat analogous to a barber shop mirror which is used by barber and customer to communicate visually, without looking at each other face-to-face.[6]

In a functional sense, the monitor is sometimes a surrogate for interactants in the other centers. That is, people behave in relation to the monitor the way they would to a person with whom they are speaking. For example, in everyday life shyness may be exhibited by avoiding direct visual contact with the eyes of other people. Shy participants in the Reading system (most notably, a few teenagers from the local high school who participated in "Is There A Generation Gap?") avoid the direct gaze of the monitor, and either look down or sweep their eyes past the monitor without ever holding a fixed gaze on it.

The host regulates interaction in a number of important ways. First, hosts regulate the length of time in which home callers or participants may speak. Unlike radio call-in shows or commercial TV shows with audience participation, where the host works under extraordinary time constraints and must often cut audience comments short, a host in the Reading system is just as likely to encourage a participant to speak longer as to cut their comments short. The mechanisms by which hosts encourage more talk by a participant or guest include:

1. A follow up question on a related issue.
2. A request for clarification of something the participant said.

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[6] This analogy was suggested by Erving Goffman.

3. The absence of a termination signal. For example, when a host says "uh-huh" at the end of a participant's comment this indicates that the host is still in a listener role vis-a-vis the participant. This may encourage more talk. If the host says, "Thank you for that comment," the participant will likely interpret it as a termination signal.

Mechanisms for terminating a participant or home caller include:

1. A statement of gratitude such as the one cited above, "Thank you for that comment."
2. A lengthy follow-up statement by the host on the subject under discussion (a short follow-up statement more readily allows the caller or participant to jump back into the conversation).
3. A reference to time constraints. For example, "We only have a few minutes left, so I'm going to take another call, but please call again."
4. A reference to another participant who is waiting to speak, e.g., "We have a comment over at the Kennedy Center." Note: it appears easier for the host to break in if the next speaker is someplace other than the location of the current speaker, e.g., when the host and the current speaker are at Horizon Center, and the new speaker is at Hensler Center.

Next, hosts may also be observed "priming the pump," particularly when there is a lull in the interaction. The host may ask for questions and comments from participants generally, a specific center, or home viewers. The strategy of asking for questions and comments from another center (i.e., other than where the program host is located) appears to be the most successful. It seems that the hosts in the other centers take on the burden of coming up with something to fill the void. In this sense, program host and center hosts are operating as a team. They try not to let the ball drop - i.e., avoid dead space or silence on the system.

As an alternate to merely asking for comments, the program host may make a new comment and then ask for reactions, e.g., "Related to that, I remember...., did anyone have a similar experience?" In doing this and appealing to other centers for comments, the host receives support from the switcher at the head end. That is, when the program host asks for "comments at Horizon," the switcher will generally punch up Horizon Center on the monitor. In this way, the system is asking for and "looking for" a comment or question from that center. Over time, the occasions when there is a "dead space," a silence with no comments forthcoming, have been greatly reduced. This may be attributed, in part, to the use of "priming-the-pump" mechanisms.

Third, the host provides a number of system instructions which serve to regulate interaction. For example, the program host may instruct the camera operator to direct the camera toward a person, or ask the switcher at the head end to show a given center on the monitor. This brings attention to certain people, objects, or issues and thereby directs interaction.

In addition, the host often assumes responsibility for dealing with "trouble," of a social or mechanical variety. If a home caller or participant speaks too long or repeats the same point over and over, the host may terminate the interaction through one of the mechanisms described earlier. If a participant or caller cannot be understood, perhaps because of a stroke-related speech problem or a strong accent, the host may repeat the question for the rest of the group. If the host can't understand the comment, he or she will be likely to ask the group if anyone can help make the comment clear. Generally, this is accompanied by a supportive statement directed towards the speaker with the problem. There are incidents which reveal a strong value in the group for encouraging anyone with a communication handicap or problem. Even in those instances where a participant could not be understood at all, the host treated the comment as if it was both appropriate and understood, then moved on.

Similarly, the host often jumps in to mitigate embarrassing moments. In one instance, during an "Oral History" show with a local high school, a student asked, "In the old days, before TV, what did couples do for entertainment?" The question brought laughter in the high school group and among the seniors. As the girl froze in embarrassment, the host jumped in - "That's a good question" - and quickly moved the conversation to a discussion of local dance halls, where couples could go for entertainment.

Some instances of "trouble" relate to a mechanical feature of the system or a physical problem of a senior. Here, both hosts and participants take responsibility for the problem. For example, in one instance a woman with poor eyesight wanted to read a poem. She needed one hand to hold the book with the poem, and the other hand to hold a magnifier. She attempted to hold a microphone as well, but this proved difficult. Seeing this, a participant took the microphone and held it for her.

Similarly, when a host has difficulty or makes an error, participants will typically provide support or treat the error as unimportant. This is especially the case when a host is performing this role for the first time. If the host is visibly nervous or performs poorly, the group either won't acknowledge the problem, or treats it as a minor mishap "that happens to everyone."

Leakage. The interactive television frame in Reading is subject to leakage from other frames taking place in the same physical space. That is, a conversation at the edge of the room, a whispered side comment by one of the participants, or sound from another part of a center may leak into the frame and be heard by everyone. This is especially possible since most of the microphones are live most of the time. In the sampled tapes, some out-of-frame activity leaked into the frame an average of 3.9 times per hour. In less than five percent of these instances was there any apparent disruption of the frame. Indeed, in some programs such as "Singalong," out-of-frame leakage may be encouraged. I noted many out of frame comments during "Singalong." A number of these were "picked up" by the host, relayed, and integrated into the program. Perhaps this suggests less formality to the program, or utilizes "surprise" and "the unexpected" as a feature of the interaction.

In general, out of frame leakage was less of a problem for the centers where it did not originate. I recorded no instances of complaints from other centers about leakage originating in a given center. However, leakage does sometimes bother the participants in the center where it occurs. I observed a "quiet" finger snap, and an index finger put to the lips as an indication for someone in the same center to make less noise.

In addition, technical comments by the switcher at the head end or another technician may be spoken over the system and heard by everyone. In the sampled tapes, some technical comment was made .9 times per hour. A decrease in these comments occurred over time. The decrease may be due to less need for such comments. However, the switcher or the head end may also communicate to the camera operators via a separate audio line that is not heard over the system, and some technical comments may have been switched to this "back channel" over time.

In any event, it may be argued that this system incorporates certain technical comments (e.g., "Can you sharpen your focus?") as part of the frame. Whether we treat it as a separate frame or part of the interactive television frame, these comments had no observable negative effects on the interaction. Indeed, there may be a positive side effect, in that participants who hear these technical comments may learn more about how the system works and/or become less fearful of the technology.

Leakage from out of frame activity does bring attention to co-extant frames in the same space or spaces bordering the interactive television activity. In this sense, the interactive television frame is quite unlike a commercial television frame, where we rarely see beyond the boundaries of a set, and where a passing fire engine brings most video recording to a halt.

Disruption. Disruption of programming (i.e., where activity was halted) because of a technical problem was rare in the sampled tapes: once every five hours. No programming was halted because of an interactive or content-related problem. It may be important to note that a serious video problem was often tolerated without stopping a program, but not loss of sound. With loss of video, the host simply provided more information, much like a radio commentator. When sound was lost, the programming stopped.[7] In a similar way, few participants commented about a poor video image. When they did, it was more often a joke rather than a complaint, e.g., "Oh, I look like a Martian now."

However, participants did interrupt on many occasions when they couldn't hear well. Indeed, this became an unwritten rule - that anyone may interrupt at any point if he cannot hear. Additionally, participants are far more likely to seek confirmation that the audio channel is clear, often saying, "Can you hear me?" than they are to seek video confirmation, such as, "Can you see me?" In general, the Reading system is more likely to experience a technical problem than most commercial television systems, but the technical problems are less likely to disrupt the programming than in commercial television.

Getting the Floor. Getting the floor to speak on interactive television may be characterized as a three stage process - though one can successfully get the floor before the third stage has been achieved. Let me explain. In order to speak, a participant must first obtain a microphone. This is the initial stage of an attempt to get the floor. Microphones are situated among the seats. They are hand-held or on stands from which they can be detached and passed around. The participants themselves control the microphones, and physically hold them while speaking. Thus, unlike audience participation in commercial television (where the host holds the microphone), or a reporter - interviewee situation (where the reporter holds the microphone), the Reading system has no regulating mechanism between a speaker and the microphone.

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[7] An analogy may be drawn with the Ford-Carter presidential debates in which a loss of sound halted the program for 20 minutes (this observation, like many others in this paper which are not acknowledged, was made by Ben Park).

After obtaining a microphone, a participant may attempt to speak immediately, or hold the microphone near his mouth as a signal to the camera operator that he wants the floor. The second stage of access involves the focusing of the camera on the person who wants to speak. Having achieved this, a participant may seek the floor immediately, or, wait for a third stage in which the switcher at the head end punches the camera into the system.

The person then sees himself or herself on the monitor. If the person seeking the floor is in the same center as the person who has the floor, then the camera operator at that center may decide to widen the shot to include both of them, or pan across to the person seeking the floor. This is the functional equivalent of being punched up on the monitor from another center.

When a person passes through the three stages described above, he or she is highly likely to attain the floor. At stages one and two, their chances of getting the floor are less certain. The rule appears to be: one may seek the floor with a microphone alone, but if the camera and monitor do not sanction your attempt (by focusing on you and showing you to the whole system) you are not likely to win the floor.

A number of variables appear to affect the likely success of attempts to gain the floor at stages one and two: the status of the person; the type of program; the location of the person who wishes to speak; and the strategy employed by the person seeking the floor. For example, presenters and hosts always have their own microphones so they can readily attempt to speak at any time. In addition, their status as a regulator of interaction or as a guest on the system who is presenting important information, gives them easy access to the floor. Also, hosts from other shows (who are simply participants in this instance) and people who regularly participate have a high status and can easily gain the floor. However, equally high status appears to be placed upon "newcomers." Thus, while a newcomer is not as skilled as a regular participant in taking the necessary steps in order to speak, he or she is likely to receive help and positive support as soon as there is any indication of a wish to speak.

Some programs are more "interactive" than others. They involve more back-and-forth talk among participants in different centers, or between presenter and participants in the same center. It is easier to gain the floor in highly interactive shows. In shows such as a cooking demonstration, where they don't regularly switch to other centers for comments (except perhaps at the end), it is more difficult to interrupt.

The successful strategies for winning the floor, which I observed in the Reading system, are similar to patterns observed in conversational analysis.[8] These include:

1. Specifying the name of the person who is currently speaking, accompanied by a request for the floor, "Blaine, can I say something?"
2. Simple additions, e.g., "You have to remember too..."
3. A non-specific agreement with the current speaker, accompanied by a suggestion that what is to follow will build on the comment just uttered, "Yeah, that's like the time..."
4. Investing syllables. Here, the person seeking the floor repeats the first syllable of the first word they want to say, at momentary pauses in the current speaker's stream of speech. For example, they may say, "Bu...Bu...," while someone else is speaking. As that person finishes a sentence, the new person who wishes to speak can then jump in with "But don't you think..." The investment of those "Bu...Bu" sounds earlier appears to give them a right to the floor before other claimants.
5. Apology. This strategy is often employed in shows which do not regularly switch to other centers for comments. For example, in a cooking show, a woman in another center wanted to interrupt. She said, "Helen," waited for a moment then repeated, "Helen." At this point, she was punched up on the monitor. She then said, "Pardon me," waited a second, and began her comment, "Helen, aren't you going to add some liquid?"

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[8] In Group 3 Report, (Carey, Draud, Messina, and Sag), Dept. of Linguistics, Univ. of Pennsylvania, 1973.

The host may also play a role in sanctioning attempts to gain the floor. The host can name a person and thereby give them the floor, "Sarah, I see you have something to say." Also, the host may direct a camera operator to show someone, which helps them to get the floor. The host's role is particularly important when a number of people are attempting to gain the floor at the same time. This is part of the host's function as a regulator of interaction. It should be emphasized here that none of these "rules" were ever formalized. They are patterns which evolved during use of the system.

More recently, after September 1976, some visual aids have become part of the process of gaining the floor. Here, the first stage of obtaining a microphone follows as before. In the second stage, the camera is pointed at the person, but not necessarily punched up on the monitor. The switcher at the head end sees that someone wants to speak. He then tells the camera operator in the center which is currently "on," via a private audio line, that someone is ready to speak. The camera operator then holds up a sign, e.g., "Question at Horizon." The host now knows someone is ready to speak, and may call for him as soon as the current speaker finishes. A host learns that a home caller is on the line and ready to speak through a similar process: the switcher relays the information to the camera operator in the program host's center, who holds up a sign, "Home Viewer." With the monitor orientation so strong, a host sometimes learns of a new speaker in his or her own center, via a sign from the camera operator -

e.g., "Someone here at Hensler."

Relinquishing the floor may be signaled verbally, by saying, "Thank you," or "That's all" at the end of a comment. However, there may be no "relinquishing phrase" as such. Here, a person simply ends his last sentence with a falling intonation. These vocal signals are generally accompanied by a kinesic pattern. The person relinquishing the floor brings the microphone away from their mouth and (often) shifts their facial gaze downward or to the side.

The process of gaining the floor which emerged in the Reading system had one interesting problem. When a person picked up a microphone and held it close to their mouth, it signaled, "I want to speak." But this signal did not distinguish "I want to speak immediately," from "I want to speak when the current speaker is finished," from "I want to speak when the current topic is exhausted, and it would be appropriate to change topics."

Thus, there were occasions when speakers got the floor *too soon*. That is, they wanted to introduce a new topic but didn't want the floor until the current discussion was finished. To deal with this, a subtle change in the first stage signal to get the floor emerged. A speaker who wishes to talk, but not immediately, now picks up a microphone and holds it *away from his mouth*. When he is ready to speak, he brings the microphone up to his mouth. As an alternative, some participants in the first rows of a center speak to the camera operator and tell them when they want the floor.

I have already noted that it is more difficult to gain the floor during programs which do not incorporate regular center-to-center interaction as part of their format. This relates to a more general issue of how centers may be categorized vis-a-vis interaction, at any given moment or during specific programs.[9] Centers may be classified as: a presenting center; an interacting center; or a viewing center. A presenting center is one in which the program host, guests, and presenters are located. Generally, the program host and guests are in the same center. However, there are notable exceptions, e.g., "Inside City Hall" in which the program host is at Hensler Center and the guest is at City Hall (a remote center). The presenting center or centers initiate a program and regulate much of the interaction (via the program host).

An interacting center is one which plays an active participatory role in the program, though the program host and guests are located in another center. Participants in an interacting center can readily ask questions, make comments, and focus attention on topics of interest to them.

A third type of center may be called a viewing center. Participants in a viewing center are passive observers of the programming. This may be due to the structure of the program (i.e., it does not encourage questions or comments); or to the mode of presentation

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[9] For a more in-depth treatment of differences among the centers, see "Design and Implementation of the Reading Interactive Cable Television System" in this volume.

(e.g., if a program is pre-recorded on video tape, live participants in a center cannot ask questions of the people on the tape); or to a characteristic of the center on a given day (e.g., there are few people present and they don't choose to ask questions). The three permanent centers in Reading (Horizon, Hensler, and Kennedy) have functioned in each of these roles, under various circumstances. Remote centers such as City Hall or the Social Security Office in Reading are nearly always in a presenting role when they are hooked into the system.

The role of viewers who participate via telephone from their homes has shifted over time from a relatively passive "viewing" role to participation much like that in an interacting center. A home viewer may speak on the system by calling a special number. They are instructed to wait on "hold," and are eventually punched into the system through the process described earlier. Home viewers are encouraged to call by the host or a message on the character generator - much like when the host asks if there are questions or comments at other centers.

In the sampled tapes, there were 3.5 "appeals" for home-viewer calls per hour. This number shifted significantly over time, from .5 appeals for home-viewer calls per hour in the January to April period, to 7.8 appeals per hour in the September to December period. During this same period, the number of home viewers who called and spoke on the system increased proportionately. In the January to April period, .3 home callers spoke on the system per hour. By December, an average of 5.3 home callers spoke on the system per hour.

As more home viewers called in, and as hosts and participants in the centers referred to home viewers more frequently, the home audience became a distinct group much like each of the centers. And they shifted from a predominantly passive "viewing" role to an interacting role. Home viewers began to initiate new topics for discussion. They referred to what previous home viewers said, and they identified themselves with their group, e.g., "I'm one of the home viewers."

Volume of Interaction

The interactive television frame is characterized by a large volume of interactions among hosts, guests, and participants, relative to one-way commercial television.

Table 1

Gross Interaction Measures*

	Per Hour	(N)
Center-to-Center Interactions	34.5	(1576)
Within Center Interactions	21.2	(971)

*Based on a sample of 45.7 hours of programming.

Table 1 represents the number of times the monitor switched from one center to another to record some input by a host, guest, or participant (center-to-center interactions); and the number of times the camera panned from one person to another in the same center (within center interactions). These numbers do not include reaction shots, where the camera shows a person who is listening to a conversation, but they do include multiple switching or camera movements within a single exchange or conversation. Table 2 below is a measure of how many participants spoke per hour.

Table 2

Participant Interactions*

	Per Hour	(N)
Center Participants	19.0	(870)
Home-Viewer Participants	1.9	(87)
Total Participants	20.9	(957)

*Based on a sample of 45.7 hours of programming.

Table 2 excludes any comments or questions by a host or guest. Further, multiple comments by one person in an exchange were recorded as one unit. Thus, Table 2 represents the number of participants who engaged in some verbal interaction during the course of an hour, throughout the sampled tapes.[10]

As noted earlier, there were some significant changes over time. The number of home callers increased steadily. This may be accounted for, in part, by the increased number of appeals within programs for home viewers to call. In addition, the potential home audience increased dramatically after September 27, 1977 when the experimental system was extended to include all cable subscribers in Reading. There were shifts in the volume of center-participant interactions as well. All of this may be seen in Table 3 below.

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[10] If a person discussed one topic early in a program, then participated in another discussion about a new topic later in the same hour, this would be notated as two units.

Table 3

Changes in Participant Interactions Over Time*

	Jan.-Apr.		May-Aug.		Sept.-Dec.	
	Pr Hr	(N)	Pr Hr	(N)	Pr Hr	(N)
Center Participants	15.8	(213)	24.7	(420)	15.6	(237)
Home-Viewer Participants	.3	(4)	1.9	(32)	3.4	(51)
Home-Viewer 'Appeals' During Programming	.5	(7)	2.1	(35)	7.8	(118)

*Based on a sample of 13.5 hours, Jan.-Apr.; 17 hours, May-Aug.; and 15.2 hours, Sept.-Dec.

Shifts in the number of center participants over time are not so readily accounted for, as are shifts in number of responses (or calls) from home viewers. These possibilities exist: first, the number of center participants grew from January to August, then dropped as the number of home callers increased, since home callers used up some of the time that was previously available for center participants; second, the expansion of the system in September, in which the programming was carried to all cable subscribers in Reading, inhibited some participants; and finally, this is a reasonable fluctuation to expect over time. Further measurement of participant interaction, after December 1976 would be required to sort out these possibilities.

Behavioral Styles

Interaction on the Reading system is characterized by a range of speech styles, from casual to formal. I believe this range in styles may be related to a number of social elements in the situation, e.g., the status of the interactants and certain features of program format. Generally, participants employed a more formal speech style (i.e., more final consonants, less syllable and word deletion, greater use of surnames, etc.) when speaking to invited guests than when speaking to other participants of equal status. Thus a doctor or the mayor are more likely to be addressed by their surnames than a regular participant. However, there are some interesting variations from this pattern:

1. A frequent high status guest may, over time, be addressed by their first name. For example, a few people addressed the Mayor of Reading by his first name "Joe" after he had appeared several times on the program "Inside City Hall."
2. A guest who is addressed by a surname often refers to the seniors, particularly the host, by a surname. For example, May F., the host on "Inside City Hall," is generally called "Mrs. F." by the politician guests on the show, who are themselves generally addressed by a surname. On other programs, where May F. is a participant and where little formal address is employed towards guests, she is called "May."

   Similarly, a host who consistently referred to her guest, an educator, as "Dr. J.," concluded a participant's question by saying, "Thank you, Mr. M." In earlier and subsequent shows, she referred to the same participant by his first name. A pattern of formal address directed toward a guest appears to affect the way participants are addressed.

3. Some participants with high social status are more likely to be addressed by their surnames, e.g., Mrs. O., a former teacher. In addition, surnames of participants are employed at more formal moments. For example, in the program "Singalong," the host dedicated a song to "Mr. and Mrs. P." Later, the host exchanged an informal greeting with the same couple, calling them "Mary and Tony." Similarly, a newcomer may be introduced by his surname.

Overall, the use of surnames occurred relatively infrequently. In the sampled tapes, a surname was mentioned 3.0 times per hour.

Speech style also appears to be related to the number of back-and-forth exchanges. A person speaking without interruption for a length of time longer than one minute employed a more formal style than when he or she engaged in a back-and-forth exchange. Moreover, I observed a number of shifts from formal to casual speech style as a person who had been speaking for some length was questioned, and a back-and-forth exchange developed. In the back-and-forth exchanges, there was more use of vocal segregates (uh-huh, um-hum, etc.), more relaxed articulation control (i.e., final "t" or "d" is not emphasized), and more contraction (can't, won't, etc.) and deletion (i.e., the dropping of syllables and words in a context where listeners can fill them in). Back-and-forth exchanges also contained more casual interjections (e.g., "You'd be amazed") and more colloquial forms, e.g., "I hated it worse than sin."

From a sociolinguistic point of view, the back-and-forth exchange appears to shift the speech act from "formal questioning" to "a conversation." I noted further that the back-and-forth pattern occurred more often at the ends of shows, when the program format may allow longer exchanges.

The end and the beginning of a day's session were occasions when interpersonal greetings were most often exchanged. In general, there was an interpersonal greeting 2.9 times per hour in the sampled tapes. By interpersonal greeting, I mean a greeting directed towards a specific person or group, e.g., "Hi Helen, how are you today?" This measure does not include the general greetings that often accompany the opening or closing of a show, e.g., "Good morning, and welcome to Sense and Nonsense."

Interpersonal greetings frequently occurred during the "sweep" at the beginning or end of a show. The sweep is a convention that developed in the Reading system, whereby at the beginning or end of a show they systematically punch up each center on the monitor. They "sweep the centers." During the sweep, everyone participating will be seen by everyone else. Commonly, when someone sees a friend at another center (via the monitor) they will speak to them, e.g., "Hi George, when are you going to come and visit me?"

In addition to interpersonal greetings, there was a small amount (1.6 times per hour) of what might be called "private communication." These included: a saying in Pennsylvania Dutch (a significant portion of the people at the centers speak Pennsylvania

Dutch); a joke based on some event a general viewer might not know; or a private message for a home viewer. There was also a strong tendency for participants and hosts to use specific rather than generic references. For example, a participant would say, "You can probably get it at Boscov's" (Boscov's is a local store) rather than the generic "You can buy it at your local store," which is commonplace on commercial television. Taken together, these measures indicate that in the Reading system, participants assume they are talking to people like themselves, who know the same things they know.

Off-Camera and On-Camera Behavior

There are systematic differences between the on-camera and off-camera behavior of participants in the Reading system. In this sense, their public presentation on the system differs from their private presentation when a camera is not focused on them. However, the differences are small in comparison to other groups such as actors or politicians,[11] teachers or doctors.[12]

A participant's movement from a more private to a more public behavioral style in the Reading system cannot be characterized as a simple on-camera/off-camera distinction. It is possible to distinguish 6 degrees of movement from "off" to "on" in this situation:

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[11] For a treatment of politicians' behavior on-camera and off-camera, see John Carey, "A Micro-Frame Analysis of the On-Camera/Off-Camera Paralinguistic Behavior of Three Presidential Candidates," University Microfilms, Ann Arbor, Michigan, 1976.

[12] On the consequences of doctors using television in their work, see Ben Park, An Introduction To Telemedicine, The Alternate Media Center, New York University, 1974.

1. Completely off - the system is shut down, no cameras or mikes are live.

2. The system is operating, but it is not focusing on this center and it is not likely to switch here (e.g., the mayor at City Hall and the host at Hensler Center are engaged in a two-way conversation).

3. The system is operating...it is focused on another center, but they might switch to this center at any moment.

4. The system is operating and focused on this center, but I'm not on-camera or near a microphone.

5. The system is operating and focused on this center - I'm within camera range and mike range.

6. The system is operating and it is focused on me - my face is on the monitor.

I began to observe these distinctions, for participants on the system, at Kennedy Center. A woman there had a cold. When the system was not operating, she would cough, bringing her hand near her mouth to minimize the outbreath but not to muffle the sound. With the system on, focused at another center, she muffled the sound of her cough slightly. With the system on, and a participant at her center holding the microphone and waiting to be switched in, she muffled her cough still more. In each of these cases, she was "off," but it was clear that there were degrees of "off." There are also degrees of "on." People situated directly on-camera are, generally, more animated in facial expression or are projecting visual information about themselves across a greater distance. Also, it is more likely that they will have an erect posture and have a unified orientation across body, face, and eyes. That is, they are not as likely to look to the side while their body and face are oriented forward.

Since most people watch the monitor most of the time, they appear quite aware of when they are "on" and when they are "off." Also, many anticipate coming on-camera. For example, one host at Horizon Center sat erect but with her face unanimated while the camera was tight on her guest. As the camera began to zoom back slowly (not yet including her in the shot) she became more animated in her facial expression - perhaps anticipating that she would momentarily be included in the shot. Interviews with camera operators supported this observation as a consistent pattern of behavior.

When seniors do "come into play" for the camera, they do not simply pop into play instantly. Nor do they pop out of play instantly when a camera moves off them. Face and body and voice move on and off in stages. For example, one on-camera participant who was nodding her head in response to something being said at another center, began to diminish the number of nods and the sweep of her head as soon as the monitor switched away from her. But three or four seconds passed before the nodding ceased.

It should also be noted that some participants vary their kinesic behavior little, if at all, from levels 1 through 6 in the on-off scale described previously. Changes in vocal behavior on and off are more consistent. The group sanctions, positively and negatively, vocal behaviors more than kinesic behaviors. By this I mean that a participant is more likely to be told, "Speak up," rather than "Sit up" by a fellow participant.

When seniors are "caught unaware," i.e., when they suddenly discover that they are on the monitor, there is relatively little reaction. They may smile, wave at the camera, or have no observable reaction. Interestingly, in the few instances where guests were caught unaware, the reactions were stronger and included some verbal comments such as "Oh, I'm on," or "Well, sorry." Also, new participants exhibit a stronger reaction.

The Reading System vs. Commercial Television

The interactive television frame in Reading may also be characterized by certain features which are not present, or are present to a limited degree, but which typically are present in other television frames - most notably, commercial television. It should not be inferred that the cable system in Reading is thereby "missing" something. To the contrary, the absence of certain commercial television patterns appears to strengthen the frame of this system.

In the Reading system, there is very little applause. In the sampled tapes, there was some form of applause 1.4 times per hour. The opening and closing of a program is not, typically, applauded. Guests are rarely applauded. This may be due, in part, to the structural organization of the programs, i.e., there are no formal entrances or exits of guests within a program. Similarly, performance is not generally applauded.

One applause convention has emerged. In the context of some group performance, a solo performance is almost always applauded.

For example, in "Singalong," most songs are sung by everyone. If one person should volunteer to sing solo, his or her performance will be applauded. Also, a first-time performance by a senior (e.g., hosting a new show) may be applauded.

In addition, a long monologue by a professional such as a doctor is sometimes applauded. This is a revealing instance. The long monologue helps to construct a performer-audience relationship, which does not exist at other times. In contexts like the theatrical stage or commercial television, performers are applauded by the audience. This happens in the Reading system as well, when the structure of the program simulates one of these other contexts. But where the professional doctor or politician speaks for shorter periods, with frequent comments and questions by the participants, there is rarely applause.

The second feature which distinguishes the system in Reading from commercial television is one I've just touched on: the relative absence of an audience, in the sense of listeners or viewers who merely respond and cannot initiate communication. Participants in the centers do become an audience for programs or function as a viewing center in the terms described earlier: where there is a long monologue; where there is a clear presentation format that is followed by questions and answers; and where the program is on video tape. Since much of the programming is not structured this way, one may observe the same center moving in and out of an audience role from program to program, and within programs.

In addition, relatively little information is read by presenters, hosts, or participants in this system. In the sampled tapes, there was some form of reading only 1.6 times per hour.[13] This is in sharp contrast to the commercial television frame where most information is scripted and read. It should be noted that seniors generally are poor readers. Many have problems with vision and no one I observed could simulate free flowing speech while reading - as some actors do. The relative absence of reading may be quite significant in that reading can bring a powerful set of behavioral modifications into the frame. The reading of written material can alter the grammatical structure of speech, tempo, intonation patterns, facial gaze direction (e.g., the face and eyes are cast downward), and the use of the hands (which may become occupied with holding papers).

When seniors talk, they make relatively few "mistakes." Minor slips are generally integrated into the ongoing speech stream, or simply not attended. But in reading, they do frequently err (i.e., do not correctly articulate the written form) and, more importantly, they frequently respond to these errors through repetition and verbal apology, e.g., "I'm sorry, let me try that again." Similarly, questions which are read from notes often sound prepared. Equally important, they tend to evoke formal answers which also sound prepared. In commercial television, some reporters and actors can sound spontaneous and genuine when reading a question from a teleprompter--the answer to which they already know. Few laymen can manage this kind of performance.

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[13] Two programs were not included in this measurement. See Appendix C.

As mentioned earlier, nearly all of the programming in the Reading system is live. Thus, there is an absence of temporal discontinuity between when a program is recorded and when it is seen; and an absence of temporal transitions within programs. A valuable distinction is made by Ben Park between real time, synchronous time, and relative time in media. Real time is coterminous with an event - the event we see on TV or film is the same length (with no internal cuts) as the actual event it presents. Synchronous time, a subdivision of real time, is the common experience of "now" to those who are present at the event, or "live TV." That is, we see the event on TV as it is actually happening. Relative time involves the manipulation of time. Through editing, an event may be shortened or lengthened, or there may be transitions from one point in time to a moment that is a few seconds or years later.

In the Reading system, most programming is in synchronous time - the viewer sees it as it is happening. In commercial television, most programming is in relative time. This has some important implications. First, yesterday, today, and tomorrow in a participant's life are the same as yesterday, today and tomorrow in the programming in the Reading system. If a program host mentions that an event will occur tomorrow, the viewer can know that the event will occur tomorrow in his or her life. If they hear that "George is sick today," they can go to the center the next day and ask if George is feeling better, knowing that he was sick the previous day. No such assumptions can be made regarding programs that are video taped and played at a later point in time.

Within programs themselves, participants often refer to issues raised "two days ago" on another program. They assume a program-day to program-day continuity that matches the day-to-day continuity in real life. Most programming on commercial television is recorded well in advance of the date (or dates) when it is played. As a consequence references to specific time frames are either avoided, or planned very carefully.

Further, since most of the Reading programs are in synchronous time, there are no retakes or edits. They are required to manage whatever occurs in a situation, and to do it in synchronous time. Curiously, this may help to stabilize the frame and make it less vulnerable to disruption. The commercial television frame on the other hand, may collapse for a minor mishap. This is due in part to the ease with which a scene may be reshot. In the Reading system, minor mishaps must be integrated into the program (there are no retakes in live programming), and this strengthens the frame.

The use of pre-recorded video tape programming on the Reading system consists of three types: a) short spot announcements with messages about social services or upcoming programs. These are played at breaks during a live program, or between programs. Many are recorded in real time, i.e., they have no internal edits; b) a five-minute yoga exercise program which is played once a day between live programs; and c) video tape segments which are used as part of a live program. For example, during a live "Scrapbook" program about railroads, a pre-recorded video tape of a railroad museum in Reading was shown. This type of segment is most often in relative time, with internal edits to shorten a sequence, as well as some transitions in time. However, it is typically preceded and succeeded by live programming, and the host or participants may speak while the video tape is running.

Though pre-recorded programming has been employed only minimally in the Reading system, the use of significant amounts would make some differences. First, it would break the temporal continuity between programming and real life that is assumed by participants, as evidenced in their discussions during programs. Second, it would confuse a visual convention that is very important to the maintenance of a participant's information state vis-a-vis what they are seeing. That is, in normal live programming, any cut, dissolve or wipe nearly always means a transition from one center to another. So when participants see one of these visual changes on the monitor, they know they are seeing a new center. It signifies a spatial transition. On video tape, these same visual conventions most often mark a transition in time (i.e., they are used to edit a long tape into a short tape). A heavy mix of video tape with live programs would confuse the meaning of these visual conventions. Third, there is evidence that some seniors cannot always distinguish pre-recorded programming from live programs. They respond to video tape, at times, as if it were live, e.g., a person in one center attempted to ask a question of someone appearing on the monitor during a pre-recorded program.

In the Reading system, a viewer is frequently made aware that the space in which a program occurs is part of a larger space, or adjoining other spaces. At times, there are references to another part of the building where the center is located, e.g., "the cafeteria downstairs." Also, unseen spaces to the side or front of a center are mentioned. More frequently, there are sounds which leak in from these bordering spaces. For example, everyone will hear a fire engine passing outside the building. As a consequence, viewers are aware that the space they see is part of a larger context. On most commercial television programs, no space exists for viewers outside the space they see on the TV screen.

The Reading system is also characterized by the absence of shifts in visual space vis-a-vis the person or object seen on the monitor. That is, since there is only one camera per center, the viewer in another center, or at home, cannot shift position in relation to an object or person, unless that person or object moves. In commercial television, where three or four cameras per studio are common, a home viewer may see a person head-on, followed immediately by a shot of the person from the side. In this sense, the Reading system more closely approximates the visual perspective we see in real life. There is a consistent visual orientation.

In addition, there were relatively few *reaction* shots in the sampled tapes (i.e., where the system cuts away from the person talking and shows a viewer's reaction). I recorded 6.7 reaction shots per hour. In contrast to commercial television, which often constructs a visual scene around an action, by switching camera angles, zooming in and out, and cutting away to reaction shots, the interactive system generally follows the action, showing the speaker or performer from a single angle, with few cutaways.

In Reading, the general rule appears to be: the person speaking is shown on the monitor. If there is much back and forth interaction, the monitor may show one interactant for longer periods, i.e., they may continue showing the first speaker while the second speaker is responding. Also, a well-known person, someone who is a regular participant and whose voice is recognizable, may make a brief comment without ever being shown on the monitor. Where reaction shots do occur on the Reading system, it is likely that a speaker has bogged down in a long monologue. The switcher at the head end reports that he most often uses reaction shots to encourage someone to break in with a question.

The characterization of roles on fiction programs, and even the presentation of "real people" such as reporters on news shows, tends to be static on commercial television. Neither Kojak nor Walter Cronkite change much from show to show, or over a period of years. Participants on the Reading system show daily fluctuations in mood and shifts in personal behavior over time. One may observe friendships growing and waning; marked changes in dress and health; and other variations that accompany everyday life.

Code Issues

I'll return now to one of the questions I asked at the outset: can the behavioral patterns and visual conventions employed on Reading's interactive cable television system be treated as a new communication code? Is this frame, and the behavior of people operating within the frame, systematically different from everyday face-to-face interaction and/or one-way commercial television?

In general, where the pattern of interaction present in a telemediated situation simulates a pattern from everyday life, it seems to be the case that participants employ a set of behaviors based on their everyday life experiences. Conversely, where the structural organization closely resembles commercial television or another telecommunication frame such as the telephone, one may observe behaviors which are imitative of code behaviors for those frames. In the early months of the Reading system, it is clear that people using interactive television borrowed patterns of behavior from everyday life frames and commercial television.

Borrowing

In early programming, some people treated the microphone like a telephone. They would first say, "Hello" and, on terminating, "Good-bye." Further, two participants I observed, put the microphone to their ear after making a comment, presumably to hear the response from the microphone. Another waved good-bye to the microphone.

Early programs were characterized by:

1. Some use of two-way radio terminology, e.g., "Eben, Kennedy calling," and "Come in Central," (i.e., Central High School).

2. Some home-movie behavior such as covering the mouth when the camera was directed on them.

3. Use of the monitor like a mirror, to groom. When some people saw themselves on the monitor, they would straighten their hair, adjust a scarf, etc.

4. The use of many speech conventions borrowed from other social situations. These included the overlong introduction and prescribed "opening joke" as in many after dinner speeches; "teacher talk" (i.e., overly precise, too slow); a verbal acknowledgement such as "Thank you" each time they were given the floor, and a prolonged taking leave such as "I want to thank you for this opportunity to speak" which is common in meetings; the giving of a home address during an introduction, e.g., "I'm Lawrence K, 1139 Church St."; and the use of various "private languages," i.e., some professionals such as doctors or lawyers used many technical words of their trade (this language barrier often served to keep participants at a distance and discouraged questions). Also, some participants spoke overly loud. They may have thought this was necessary, since other centers were "far away." Or, this may have reflected some early problems in the audio. At times, it was difficult to hear the other centers. Speaking overly loud may have been an attempt to compensate.

In most of the instances cited above, the immediate context on interactive television simulated, in part, the context from which people borrowed patterns of behavior.

In addition, some early programming borrowed formats and conventions directly from one-way commercial television. An early cablecast of a religious service employed a format akin to "Hour of Power" and other religious programs on commercial television.

The stand-up lecture, common to many educational TV shows, was employed. So, too, there were instances of the coffee table discussion format of some commercial TV talk shows - with little audience participation or center-to-center interaction. The use of these patterns created non-interactive patterns like one-way commercial television. They separated performers and audience, with the performers speaking while the audience listened.

Specific visual conventions borrowed from commercial TV also tended to evoke patterns of behavior like commercial television. One early program, "Anna's Alley," used an opening like "The Johnny Carson Show," including a character-generated visual - "He-re's Anna." In response to this, the audience applauded.

After the system had been in operation for a year and a half, use of these patterns had diminished, and patterns specific to interactive television emerged. However, one may still observe the early patterns, particularly in the behavior of newcomers to a center. The development of conventions and a code of behaviors which are specific to this system is crucial to the emergence of a stable interactive TV frame.

Conventions and Code Behavior on the Reading System

Some of the conventions and code behavior specific to the Reading system have already been discussed. These included ways of getting the floor; a center-to-center information flow; and mechanisms for communicating transitions from one center to another. These patterns relate to characteristics of the Reading system. For example, seating arrangements help foster an orientation to the monitor and a center-to-center information flow. The use of one camera per center provides a structure for communicating spatial transitions. As I discussed earlier, since there is only one camera in each center, any cut, dissolve, or wipe communicates a spatial transition from one center to another. And, the code rules for obtaining the floor emerged, in part, because of a decision by the designers of the system to keep the audio lines open.[14] This means that most of the microphones in all the centers are live, most of the time. As a consequence, participants do not have to pass through a mechanical stage such as pressing a button, in order to speak. Thus the code rules for getting the floor (described earlier) are largely social.

A number of additional system conventions have emerged such as the split screen. Here, one half of the screen shows a person at one center and the other half of the screen shows another person at a different center. The split screen is commonly used when there is a back-and-forth exchange among people at different centers. Rather than switch back and forth between two centers, the split screen allows both centers to appear on the screen simultaneously. In the sampled tapes, a split screen was used 3.5 times per hour. However, use of the split screen grew markedly over time, from 2.5 per hour during January-April, to 6.2 per hour in the September-December period. The split screen is now used conventionally whenever two or more people at different centers engage in an extended back-and-forth exchange.

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[14] For a more detailed treatment of this issue, see "Design and Implementation of the Reading Interactive Cable Television System" in this volume.

The fade out, where the screen gradually becomes black is used to terminate a segment. Most often, it is used to signal the end of a spot announcement. Less frequently, it is used to terminate a program. Consistent open and closing conventions have emerged as well. Typically, a show opens with a graphics card stating the name of the show, with music played underneath. The "sweep" (discussed earlier), in which the camera pans across each center systematically, is used by many hosts conventionally to open or close a show. Specific shows have their own conventions for opening and closing, e.g., "Singalong" which always ends with the song, "In the Garden." A specific code of words has emerged. It includes "head end," "centers," "sweep," and others. Conventionalized phrases are employed to signal program transitions and provide instructions to participants as well.

In addition, a system of kinesic conventions is regularly employed. Most of these are used off-camera, where someone wishes to communicate without being heard over the system. For example, an index finger pointing at someone means "You're next." A "T" formed by placing one hand in a horizontal position directly over the other hand in a vertical position, means "How much time is left?" An open hand moving from a vertical to horizontal position means "Cut" or "Stop," as when a host wants to stop a video-tape segment that is being shown during a live program. Finger displays are used to communicate numbers, in various contexts. Also, people off-camera will sometimes "lip" words (i.e., form the words very precisely with their lips, without vocalizing), or mime an action (e.g., make believe they are holding a microphone, then bring it close to their mouth - to indicate to someone that she should bring the microphone closer to her mouth).

The use of these conventions and patterns over time suggests that a distinct communication code is emerging in relation to the interactive TV frame in Reading. Over time, the range of patterns and behaviors employed to communicate spatial transitions, locations in space, and the opening and closing of shows, has narrowed. For example, there is less reliance on wipes, dissolves, and cuts, and more use of split screens.

Conventions are used more consistently. This holds for both system conventions and individual program conventions. A home viewer or participant in a center can thereby infer meaning more reliably from a convention. Conventions are becoming more efficient, in the sense of communicating the same meaning in less time. For example, the closing of an interaction or raising the information state of an audience about a feature of programming was communicated in less time during September-December than January-April of the sampled tapes. Finally, the coding of some information has become more symbolic, e.g., a graphics card or music now communicate program information which formerly was conveyed through verbal statements.

Learning To Use The System

There are some measures which indicate that the conventions and patterns employed in the system have been learned by the participants in the centers. The number of occasions in which someone requested information about the frame (i.e., they did not understand some aspect of what was going on) diminished from .9 per hour to .5 per hour in the last third of the sampled tapes. And the number of occasions in which the switcher at the head end interceded to provide missing frame information diminished from 1.6 per hour to .3 in the same length of time.

Observation of participant behavior over time reveals that other forms of learning have taken place. Participants learned certain technical features of the system. This was required of them to communicate successfully. For example, participants learned that in order to be heard one must obtain a microphone and speak into it. Generally, guests and hosts each have a lavalier, desk, or stand microphone. In addition, microphones are always present where the participants are seated. In the early days of the system, many people either did not know the function of a microphone or assumed they would be picked up from anywhere (the microphones used are directional to avoid feedback problems and therefore do not readily pick up sounds outside the directional path of the mike).

Thus, many people spoke without picking up a microphone and were not heard by participants in the other centers. Also, some users held the microphone improperly, which resulted in a weak or distorted signal. As a result, many interactions in the first few months of system operation were interrupted, as system technicians instructed people to get to a microphone or adjust the way they held a microphone. These problems were greatly reduced after three or four months. Not only have participants learned this aspect of the technology, but newcomers to the system are now taught appropriate behavior for the microphone by fellow participants.

Learning proper orientation toward the camera was less of a problem since the camera is physically proximate to the monitor, and the seating arrangements help foster an orientation toward the monitor. If a person looks at the monitor, they will be seen full face by participants in other centers and home viewers. In addition, participants quickly learned when they were "on" or "off" (the monitor tells them). Nonetheless, newcomers to the system reveal a lack of knowledge about the camera and monitor. Some wave at the camera even though the monitor clearly reveals that they are not "on." And some walk between a participant who is "on" and the camera, thus cutting off the view of participants in the other centers. Also, in the early programming, before a strong monitor orientation developed, some participants oriented their facial gaze and bodily posture towards the microphone. They huddled over the microphone, looking at it as they spoke. In this position, eyes were often cast downward, toward an empty space in front of them, or toward another person in the room. Gradually, this facial orientation toward the microphone gave way to a monitor orientation.

A significant number of participants have also learned to give "system instructions." They have gained sufficient knowledge of the technology and feel free to tell a camera operator to move a camera, or instruct the switcher at the head end to punch up a particular center on the monitor. In the sampled tapes, system instructions were given by seniors 1.5 times per hour. These system instructions may be quite explicit, e.g., "Can you move the camera and show the poster?" "Can you make this bigger?" (i.e., zoom in), "Can I see Viola?" (i.e., punch up the camera at the center where Viola is situated). Or, they may involve a subtle cue to a camera operator. In one instance, Sarah W. gave a system instruction by saying, "Celeste" (the name of a camera operator) as she cast her eyes downward. This was an indication to Celeste that Sarah wanted the camera to be tilted down in order to show a dish on the table in front of Sarah. And indeed, Celeste tilted the camera. First-time guests, as well as hosts and participants, may provide system instructions. In such cases, the host typically provides the initial system instruction, e.g., naming the camera operator and requesting some camera movement. The guest learns from this and subsequently initiates the system instruction. It may be mentioned here that all camera operators and system operators are referred to by name, and thus are part of the frame.

These limited measures of participant learning vis-a-vis the characteristics of the system and "rules" of interaction on the system suggest that the interactive television frame does now exist as an internalized model for many users of the system. This is not to say that other models, notably commercial television, do not still exist for some participants. Similarly, it should not be concluded that the interactive television frame as outlined here will continue as the dominant one for all future users. Even at the end of the period under study, a few participants clearly modeled their behavior after a commercial TV personality. And, the stability of the interactive TV frame over time remains to be tested.

Conclusion

Major Characteristics of the Reading System

There are four communication characteristics of the Reading system I would emphasize:

1. It is an interactive system. Most of the programming flows from an interactive exchange among participants in the centers and the home viewers. Further, the conventions and patterns of code behavior which emerged are related to the need to communicate in a highly interactive setting.

2. From a communication point of view, the monitor is the center of the Reading system. It designates what is officially 'on' in the system; provides a link through which center-to-center (and within center) interactions take place; and receives the constant attention of everyone using the system. In this sense, the monitor in Reading's interactive system has an importance that is often attributed to the camera in commercial television environments.

3. The interactive television frame in Reading is very fluid. It can readily accommodate leakage from spaces bordering the centers, minor technical difficulties, the exchange of technical and private communication over the system,

participants with communication handicaps, etc. Interestingly, this fluidity is a source of strength. A static frame such as commercial television is far more easily disrupted than the Reading system.

4. It is a highly complex communication system. At times, there are eight separate sources of communication feeding into the system: the three main centers; a remote center; the head-end switching center; a home viewer; a video tape playback machine; and an audio tape playback machine.

Implications For Other Users of Interactive Television

It is very telling that the users of this highly complex communication system are a group of senior citizens. This speaks loudly about how this group's capabilities have been underestimated and about the way we have overestimated the expertise required to communicate successfully via complex telecommunication systems.

Not only have seniors learned to use a complex telecommunication system, but, in the process, many appear to have improved their general communication skills. This may prove to be a valuable side effect of such a system. It makes demands of users to learn about the system in order to communicate successfully. Having done this, users emerge with communication skills they did not possess before or did not possess to the same degree.

If one message of the project is that groups like senior citizens can use complex technology to engage in successful communication, a concommitant message is: it doesn't happen "naturally," just because the equipment is installed. The findings in this report show quite clearly that seniors had to go through a learning process, and the interactive frame itself had to be built through conscious decisions about the design of centers, the placement of microphones and cameras, the format of programs, etc. These decisions, and subsequent adjustments to decisions, bore the dual burden of meeting the needs of interactants while accounting for the characteristics of the system.

Related to the above, what emerges from the project is not a package of rules about how to design an interactive TV system, but some guidelines for approaching such a problem.[15] Clearly, the number of centers involved, the size of the groups, and decisions (or restrictions) about the number of cameras per center, the type and number of microphones used, etc., will have crucial implications for the patterns of interaction that take place.

Is Interactive Television a Distinct System?

Based on the findings reported here, I would suggest that interactive television is not a narrow channel modification of face-to-face interaction, nor is it a broad channel form of one-way commercial television. Though it shares some characteristics of both, interactive television is a distinct communication system, with an emerging code of behaviors and conventions.

This is not simply an academic issue. If we treat interactive television as a form of face-to-face interaction, users are likely to place demands on the system to do what people can do in face-to-face interaction. No telecommunication system can duplicate an exchange which is mediated only by the sensory apparatus. Interactive television will, under these circumstances, forever fall short of the standard we match it against. Conversely, if we adopt one way television as a model for interactive TV, users will likely imitate program formats and styles of behavior present in commercial television.

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[15] For a more detailed treatment of this issue see "Design and Implementation of the Reading Interactive Cable Television System" in this volume.

This presents at least two major obstacles. First, few (if any) interactive TV systems could match the production budgets of commercial television. Programs that attempt to copy commercial TV formats will therefore look like cheap imitations. Second, the likely users of interactive television are not actors, and will not be able to match the performance of commercial TV actors.

In general, if interactive TV mimics commercial TV, viewers will inevitably compare it to commercial TV, using the standards of commercial television (e.g., elaborate sets, costuming, etc.). Interactive TV can stand up against commercial TV as an alternative, but not as an imitation.

A more reasonable and, I believe, more valid approach is to research the characteristics of interactive television systems, and explore the kinds of communication for which it is best suited. With this knowledge, we can apply interactive television to meet those needs which it can help fulfill.

Communication Conventions

This study offers some clues to a general understanding of how conventions in a communication system emerge. First, the specific characteristics of the technology used in a system provide some of the bricks from which conventions may be constructed (e.g., special-effects generators in the Reading system provided a split screen mechanism that was subsequently incorporated into a system convention). In a similar way, the decisions of those who designed the system pre-established some of the conventions that were likely to emerge. These kinds of decisions also foster certain patterns of communication, such as a center-to-center information flow, which then require a set of conventions to manage the flow.

Second, the needs of a system to build and maintain an information state among users and to regulate the patterns of interaction which take place, will determine some conventions. Third, people who must use a new system to communicate, or who use an established system for the first time, tend to borrow conventions from other communication systems they know. Over time, they learn the conventions of the new system.

Finally, patterns of conventions appear to change over time, in several ways. The range of elements within a convention narrows. Also, it tends to become more efficient, in the sense of communicating the same meaning in less time. The form of a convention may become more symbolic, e.g., when visual symbols replace verbal statements. These elements would tend to stabilize conventions. It is likely that forces of novelty, the need to communicate something new, or simply to communicate the same idea in a fresh, new way will cause conventions to change in other ways. In language, for example, forces of stability and novelty are working simultaneously. However, this study covers a period during which conventions in the system were just becoming established and when the need to stabilize a system was strong. It would require a follow-up study to examine forces of novelty.

Future Research

This study highlights the need for further research in several areas. It appears that a stable frame has been established in the Reading system. However, the long term stability of the frame, including the process of change within the system, needs to be studied. In particular, it would be valuable to assess the effect of widening the home audience to include all cable subscribers in Reading which occurred in September 1976.

This study examines one interactive television system. It would be valuable to compare the Reading system with other interactive TV systems in order to understand the general characteristics of interactive television in all its possible applications. The approach taken here to examine the communication patterns and conventions in the Reading system may have application to a general examination of the relation between telecommunication systems and the behavior of those who use such systems. The interaction between telecommunication systems and the behavior of those who use them is still not adequately understood.

APPENDIX A

Glossary

Applause: Any clapping by one or more persons.

Center-to-Center Interaction: A switch on the monitor from one center to another to record some input.

Formal Address: The use of a surname.

Give Frame Information: A host, guest, participant, or visual display provides information about the name of a show, who is speaking, which center is visible on the monitor, etc.

Greetings: An interpersonal exchange between two or more people which is not part of a program or guest introduction.

Home-Viewer Appeal: A request or encouragement for home viewers to call a phone number and speak on the system.

Home-Viewer Question or Comment: Any comment or question by a home viewer, spoken on the system.

Out-of-Frame Leakage: Any conversation heard on the system from a space which we cannot see, e.g., the back of a center.

Participant Question or Comment: Any comment or question by persons other than the host, guest, presenter, or home viewer.

Private Communication: Any comment that is likely to be understood only by a limited part of the audience, e.g., a comment in a foreign language, or a reference to a private meeting, without any explanatory comment.

Reaction Shot: The display on the monitor of a person who is not speaking or about to speak, but simply listening to another person.

Reading: Any reading from notes or a card.

Request Frame Information: A request by a participant, guest, or host for information about the name of a program, who is speaking, which center is on the monitor, or what is happening at a given moment.

Sweep: The systematic display on the monitor of each center, one after another.

Within Center Interaction: A camera pan from one person to another within the same center.

APPENDIX B

Changes in the System Over Time

	Jan.-Apr.		May-Aug.		Sept.-Dec.		TOTAL	
	Pr Hr	(N)	Pr Hr	(N)	Pr Hr	(N)	Pr Hr	(N)
Within Center Interaction	21.0	(284)	27.3	(464)	14.7	(223)	21.2	(971)
Center-To-Center Inter.	31.1	(420)	40.9	(696)	30.3	(460)	34.5	(1576)
Sweep	1.0	(14)	1.1	(18)	.7	(11)	.9	(43)
Reaction Shots	2.6	(35)	2.9	(49)	14.5	(220)	6.7	(304)
Home-Viewer Appeal	.5	(7)	2.1	(35)	7.8	(118)	3.5	(160)
Home-Viewer Ques. or Com.	.3	(4)	1.9	(32)	3.4	(51)	1.9	(87)
Participant Ques. or Com.	15.8	(213)	24.7	(420)	15.6	(237)	19.0	(870)
Greetings	3.6	(48)	2.7	(46)	2.6	(39)	2.9	(133)
Applause	.7	(10)	1.8	(30)	1.6	(24)	1.4	(64)
Private Communication	1.9	(25)	1.9	(33)	.9	(14)	1.6	(72)
Formal Addr.	3.3	(45)	1.6	(27)	4.1	(63)	3.0	(135)
Reading	1.9	(25)	1.3	(22)	1.8	(28)	1.6	(75)
Request Frame Information	.7	(9)	1.1	(19)	.5	(8)	.8	(36)
Give Frame Information	8.1	(109)	12.5	(213)	16.0	(243)	12.4	(565)
Out-of-Frame Leakage	6.1	(82)	2.4	(41)	3.6	(55)	3.9	(178)
N Hrs in Sample		(13.5)		(17.0)		(15.2)		(45.7)

APPENDIX C

When measures of interaction volume and style are applied to specific shows, there are some clear differences. Further, there appears to be some relation between the volume of interaction in a program and its general 'success,' as measured by the limited barometers available, i.e., audience attendance, word-of-mouth reports, etc. Thus, programs like "Singalong" and "Sense and Nonsense," which appear to be well-liked and well-attended, are among the highest in volume of interaction. However, the interaction measures applied here should in no way be considered a way to predict the success of a program. A number of additional variables such as content, interest, and the skills of a program host are always at work. With this qualification clearly stated, it can be argued that volume of interaction appears to be one important element which contributes to the success of programming.

A few programs which were included in the sample are not presented in these tables. The viewing time was too short to draw any inferences from the data.

APPENDIX C

(Cont'd.)

Differences Among Programs

	Singalong		Scrapbook		Adventures in Maturity		Your Money And You	
	Pr Hr	(N)	Pr Hr	(N)	Pr Hr	(N)	Pr Hr	(N)
Within Center Interaction	29.7	(171)	20.0	(83)	16.9	(55)	7.9	(29)
Center-to-Center Inter.	61.0	(351)	33.4	(139)	17.5	(57)	24.9	(91)
Sweep	.7	(4)	.7	(3)	1.5	(5)	.8	(3)
Reaction Shots	.3	(2)	2.6	(11)	4.9	(16)	17.5	(64)
Home-Viewer Appeal	.9	(5)	2.6	(11)	0.0	(0)	4.4	(16)
Home-Viewer Ques. or Com.	.7	(4)	1.9	(8)	.9	(3)	3.3	(12)
Participant Ques. or Com.	5.9	(34)	46.6	(194)	13.5	(44)	8.7	(32)
Greetings	4.9	(28)	2.6	(11)	2.5	(8)	2.2	(8)
Applause	1.9	(11)	0.0	(0)	0.0	(0)	.3	(1)
Private Communication	3.0	(17)	2.6	(11)	1.2	(4)	0.0	(0)
Formal Address	.2	(1)	0.0	(0)	4.3	(14)	6.3	(23)
Reading	*	*	.2	(1)	1.5	(5)	1.6	(6)
Request Frame Information	.5	(3)	1.2	(5)	.6	(2)	.3	(1)
Give Frame Information	5.0	(29)	11.0	(46)	7.1	(23)	11.5	(42)
Out-of-Frame Leakage	5.0	(29)	2.9	(12)	3.4	(11)	1.9	(7)
N Hrs in Sample	(5.75)		(4.16)		(3.25)		(3.66)	

* This was treated as a special category due to the way it was incorporated in the program.

	Council Digest		Inside City Hall		Around Berks County		Eben and Herb Show	
	Pr Hr	(N)	Pr Hr	(N)	Pr Hr	(N)	Pr Hr	(N)
Within Center Interaction	10.8	(9)	5.8	(19)	12.0	(15)	50.0	(38)
Center-to Center-Inter.	26.5	(22)	42.8	(139)	21.6	(27)	57.3	(43)
Sweep	3.6	(3)	1.2	(4)	1.6	(2)	0.0	(0)
Reaction Shots	26.5	(22)	14.5	(47)	0.0	(0)	5.3	(4)
Home-Viewer Appeal	4.8	(4)	11.0	(36)	1.6	(2)	0.0	(0)
Home-Viewer Ques. or Com.	1.2	(1)	4.9	(16)	.8	(1)	1.3	(1)
Participant Ques. or Com.	2.4	(2)	14.5	(47)	23.2	(29)	44.0	(33)
Greetings	4.8	(4)	1.5	(5)	4.8	(6)	0.0	(0)
Applause	0.0	(0)	.3	(1)	0.0	(0)	2.7	(2)
Private Communication	1.2	(1)	.3	(1)	0.0	(0)	1.3	(1)
Formal Address	4.8	(4)	15.7	(51)	1.6	(2)	2.7	(2)
Reading	4.8	(4)	.3	(1)	.8	(1)	0.0	(0)
Request Frame Information	1.2	(1)	1.5	(5)	0.0	(0)	2.7	(2)
Give Frame Information	18.0	(15)	19.7	(64)	23.2	(29)	8.0	(6)
Out-of-Frame Leakage	7.2	(6)	3.1	(10)	3.2	(4)	8.0	(6)
N Hrs in Sample		(.83)		(3.25)		(1.25)		(.75)

	Sense and Nonsense		Be My Guest		I'm Glad You Asked		Sound Off	
	Pr Hr	(N)	Pr Hr	(N)	Pr Hr	(N)	Pr Hr	(N)
Within Center Interaction	26.5	(53)	19.3	(29)	3.6	(3)	21.8	(31)
Center-to Center-Inter.	114.5	(229)	16.7	(25)	22.9	(19)	8.5	(12)
Sweep	1.5	(3)	.7	(1)	0.0	(0)	0.0	(0)
Reaction Shots	2.5	(5)	7.3	(11)	9.6	(8)	14.0	(20)
Home-Viewer Appeal	9.5	(19)	4.0	(6)	7.2	(6)	9.2	(13)
Home-Viewer Ques. or Com.	3.0	(6)	4.0	(6)	1.2	(1)	5.6	(8)
Participant Ques. or Com.	26.5	(53)	12.0	(18)	15.6	(13)	19.7	(28)
Greetings	4.0	(8)	0.0	(0)	1.2	(1)	.7	(1)
Applause	6.5	(13)	6.0	(9)	0.0	(0)	1.4	(2)
Private Communication	2.0	(4)	2.0	(3)	0.0	(0)	0.0	(0)
Formal Address	0.0	(0)	4.0	(6)	2.4	(2)	3.5	(5)
Reading	*	*	.7	(1)	3.6	(3)	1.4	(2)
Request Frame Information	0.0	(0)	.7	(1)	2.4	(2)	0.0	(0)
Give Frame Information	22.0	(44)	11.3	(17)	13.2	(11)	16.2	(23)
Out-of-Frame Leakage	10.0	(20)	1.3	(2)	2.4	(2)	2.1	(3)
N Hrs in Sample	(2.00)		(1.50)		(.83)		(1.42)	

* This was treated as a special category due to the way it was incorporated in the program.

	Party Line		Oral Hist./ Generation Gap		Dancing with Blaine	
	Pr Hr	(N)	Pr Hr	(N)	Pr Hr	(N)
Within Center Interaction	18.4	(23)	21.2	(69)	14.1	(13)
Center-to Center Inter.	19.2	(24)	44.0	(143)	41.3	(38)
Sweep	1.6	(2)	.3	(1)	1.1	(1)
Reaction Shots	8.0	(10)	12.3	(40)	0.0	(0)
Home-Viewer Appeal	8.0	(10)	2.5	(8)	0.0	(0)
Home-Viewer Ques. or Com.	6.4	(8)	.9	(3)	0.0	(0)
Participant Ques. or Com.	30.4	(38)	46.2	(150)	8.7	(8)
Greetings	8.8	(11)	1.5	(5)	8.7	(8)
Applause	0.0	(0)	.6	(2)	0.0	(0)
Private Communication	8.8	(11)	0.0	(0)	2.2	(2)
Formal Address	.8	(1)	2.2	(7)	0.0	(0)
Reading	0.0	(0)	2.8	(9)	0.0	(0)
Request Frame Information	0.0	(0)	.6	(2)	2.2	(2)
Give Frame Information	17.6	(22)	7.7	(25)	9.8	(9)
Out-of-Frame Leakage	0.0	(0)	1.5	(5)	6.5	(6)
N Hrs in Sample		(1.25)		(3.25)		(.92)

CITIZEN PARTICIPATION THROUGH TWO-WAY CABLE TELEVISION

by

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and

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CITIZEN PARTICIPATION THROUGH TWO-WAY CABLE TELEVISION

CHAPTER 1

Introduction

Local governments are responsible for the provision of public services which most directly influence the quality of urban life. Such services as police protection, planning, and education are among the functions performed by local governments which affect day-to-day life of city residents. Voting, letter-writing, attendance at public meetings, and membership in civic groups are just a few of the ways in which citizens participate in decisions concerning the delivery of urban services. Attempts to increase citizen involvement in decision-making processes have proliferated as the size and specialization of public sector organizations have increased and as traditional mechanisms such as the political machine have declined. These efforts have primarily involved the creation of new institutional structures such as "little city halls" or citizen advisory boards which are designed to increase community participation in urban government.[1]

In recent years, electronic media have been used to encourage citizens to participate in decision-making processes. The radio, telephone, and television have been used alone, or in combination, to facilitate citizen involvement at local, regional, and federal levels of government. Elected officials have used the radio with telephone call-ins to obtain citizen feedback on public policies and programs. Public television has been used to televise "town hall meetings" to residents of an entire metropolitan region. And, electronic polling has been tested as a mechanism for citizens to vote on local education policies directly from their homes.[2]

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[1] See, for instance, Robert K. Yin and Douglas Yates, Street-Level Government, Lexington, Massachusetts: Lexington Books, 1975.

This report describes and analyzes the use of interactive cable television as a means for citizens to communicate directly with local government officials. It is based on an analysis of the two-way cable television programs which were conducted as part of the experiment in Reading, Pennsylvania. Senior citizens and local officials were able to see and hear each other as they discussed local issues via cable television.

The experimental system and the factors which distinguish it as a mechanism for citizen government interaction are described in Chapter 1. An analysis of how the two-way cable system was used and the changes which occurred in the behavior of the participants is presented in Chapter 2. The discussion is based on a content analysis of the videotapes of the "Inside City Hall" programs. Chapter 3 summarizes the findings of the content analysis and discusses implications of the Reading two-way cable television system for citizen participation in other urban communities.

The Reading Two-Way Cable System

The Reading cable system represents an attempt to use communications technology to facilitate the involvement of an age-specific subgroup in local decision-making processes. The experimental system was comprised of three neighborhood communication centers (NCCs) which were linked together via cable television. Interactive programming originating from the NCCs as well as from local government offices such as city hall and the county court house. Programs were transmitted two hours a day, five days a week. The programs were conceived and produced by senior citizens and representatives of public sector organizations in collaboration with locally-hired staff.

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[2] For further discussion of citizen participation and communication technologies, see Amitai Etzioni, "Minerva: An Electronic Town Hall," Policy Services 3 (1972), pp. 457-474; Ithiel de Sola Pool, "Citizen Feedback in a Democracy," Talking Back: Citizen Feedback and Cable Technology, Ithiel de Sola Pool, editor, Cambridge, Massachusetts, MIT Press, 1973; and Edwin B. Parker, "On-Line Polling and Voting," Planning Community Information Utilities, H. Sackman and B. Boehm, editors, American Federation of Information Processing Societies Press, 1972.

The two-way cable system was designed to complement the existing political processes rather than to impose a sophisticated but artificial technology on both citizens and elected officials. At the very outset of the project, the mayor agreed to participate in a monthly program titled "Meet the Mayor," in which he discussed municipal affairs with senior citizens. The success of this program led to the development of a weekly program, "Inside City Hall," in which each member of the city council appeared on a rotating basis to meet and talk with senior citizens.

These informal teleconferences allowed senior citizens to articulate their interests directly to elected officials on a regular basis without encountering the time or travel costs of visiting city hall or the institutional and psychological constraints of participating in formal public meetings. The content of the programs was open-ended; it was a product of senior citizens' concerns and the expertise of the participating officials. Citizens used the programs to request information, make specific demands, and evaluate municipal policy.

The two-way cable programs provided an opportunity to modify the traditional pattern of citizen participation in local government. The extent to which citizens and elected officials used the opportunity created by the interactive cable system was influenced by three factors: 1) the size of Reading and the structure of the municipal government; 2) the role of citizens in coordinating the cable programs; and 3) the audio-visual properties of the interactive medium.

The Size and Structure of the Reading Municipal Government

Reading is an industrial city of 87,643 with an unusually high proportion of people 65 years or older (15.8%) and a relatively low percentage of people ages 0-19 (30.7%). The city of Reading has a long history of being responsive to the needs of senior citizens; the nation's first public housing project exclusively for senior citizens was built in Reading during the 1930's. The median age in Reading is 36.9, somewhat older than the population in comparable Pennsylvania cities and seven years older than the state median age. Hence, senior citizens in Reading constitute an important political group and the public sector has an established tradition of serving their special needs. The non-white population in Reading is only 6.8% of the total population. The non-white population is almost entirely black and is concentrated in one section of the city. Unlike many central cities in the United States, where non-whites make up a much larger proportion of the population, racial conflict is not a major public problem in Reading. The scale of the interactive cable system was designed to encompass the jurisdictional boundaries of the municipality and to serve the needs of one population group, the elderly.

Another factor which influenced the interactive cable programs was the structure of the Reading city government. The city of Reading is governed by a modified commission form of government in which legislative and administrative duties are combined. There are four city councilpersons and a mayor, each of whom has authority over one or more municipal departments. The mayor is elected for a four-year term and two councilpersons are elected to four-year terms in odd numbered years. Although the entire council must approve most personnel and budgetary matters, the individual councilpersons have considerable control over the operations of their departments.

The size of the Reading municipal government also affected the interactive programs. The city's annual budget is approximately $25 million and it has approximately 850 employees. Reading is a city in which the elected officials have knowledge of municipal programs and personnel and can exercise direct authority over departmental activities. Because each Reading councilperson has administrative responsibility for a set of municipal departments, the subject of each interactive cable television program was often focused on the specific service functions under their control. Citizens could interact with informed and authoritative officials who had the power to act in specific functional areas (i.e., streets, water supply, parks). Thus, the commission form of government allowed citizens to press for and receive specific commitments from their elected representatives who were also in the position of having direct administrative authority over the municipal bureaucracy.

The Role of Citizens in Coordinating the Cable Programs

The nature of the citizen-government programs was influenced by the fact that the interactive programs were embedded in an experimental cable system which was oriented towards senior citizens and the public organizations that served them. In fact, citizen-government interaction occurred in the context of a cable system which generally was regarded as "belonging" to senior citizens, rather than to the city government or a commercial television company. Although conventional radio and television stations often broadcast discussion programs dealing with public issues and current events, the two-way cable system in Reading differs from such one-way programs in three important respects. First, citizens, rather than professional experts or public officials, determined the agenda and content of the sessions. Second, the discussions with elected officials were conducted on a regular and recurring basis so that ideas could be pursued and developed over time and citizens had an opportunity to follow up on the actions taken by elected officials.

A third aspect which distinguished the Reading system was the fact that citizen participation occurred in a group context. In recent years, many politicians have used telephone call-in programs to answer citizen's questions. In the Reading system, individuals were involved in a collective discussion and one person's comments would often be elaborated, supported, and, in some cases, refuted by fellow citizens. This is quite different from other modes of electronic communication in which participation occurs on an individual basis. As Kenneth Laudon has noted, "political opinions are framed in the context of community groups....and formal voluntary associations." He points out that political participation through electronic devices based in isolated homes can have serious implications for the overall political system:

> If the locus of political attitude formation shifts from subgroup settings to the isolation booths of millions of homes, the protective functions of subgroup will be lost. Bereft of the advice, political savvy, and information

> provided by peers in group settings, the citizen becomes more "mobilizable," more accessible, than at present. Weakening these subgroups by providing functional political alternatives to their existence removes an important structural check on the power of societal elites.[3]

Several two-way cable programs were produced in which citizens spoke with public officials in addition to "Meet the Mayor" and "Inside City Hall." One program series, "What is County Government All About?" involved discussions between senior citizens and the three Berks County Commissioners. Also, during the 1976 Pennsylvania presidential primary campaign, debates among the representatives of the major candidates were carried over the interactive cable system. A locally elected state senator often used the two-way system to talk with senior citizens about policies and programs for the aged. Finally, one group of senior citizens produced a weekly program in which they reported on city council meetings and state legislation concerning the elderly.

The Nature of the Medium

The visual properties of this medium also influenced the interaction between the senior citizens and public officials. First, two persons appearing on a split screen are visually equal no matter what their difference in status off the screen. They are literally the same size. Thus, the interactive TV system has an equalizing effect, at least in visual terms.

Moreover, two persons of potentially unequal status must share common space in the interactive medium. The manipulation of physical space and objects to symbolize the status of public officials is not possible. There was no podium or desk separating elected officials from citizens and the physical gap between a stage and an audience was also not present.

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[3] Kenneth C. Laudon, Communications Technology and Democratic Participation, Praeger Publishers, 1977, p. 37-38.

Third, there is a measure of "derived" power by virtue of the prestige of television. People who appear on television are generally perceived as important. The status and visibility associated with television has also affected senior citizens. Certain senior participants are often stopped on the streets or in the shops of Reading with an "I know you, you're 'Jane Smith' from BCTV." This experience may be commonplace for public figures, but it is a new experience for senior citizens. In our discussions with senior citizens they recount it with great pride. Participants seemed to derive a sense of worth and importance from being "recognized" members of the community.

Research Issues

The interactive cable system clearly differed from the traditional ways in which citizens participate in local government affairs. But how were the opportunities presented by the two-way cable system used to enhance communication between citizens and elected officials? What actually took place between the senior citizens and the city councilpersons in their half-hour weekly meetings? More importantly, how did the existence of this new medium affect the seniors and the councilpersons? Did the nature of their interactions change over time? Did citizens assert themselves more, and did the councilpersons become more responsive to their demands? Three major research questions were addressed to deal with these issues:

1. What was the content of the interactions between senior citizens and public officials on the two-way cable system?
2. What type of verbal behaviors did the senior citizens and public officials engage in during the course of the experiment?
3. What were the effects of the interactive cable system on senior citizens' reported sense of political efficacy?

The following chapter contains a detailed statement of the research objectives and methods employed to answer these questions.

CHAPTER 2

Citizen/Government Interaction: An Observational Analysis

Objectives of the Observational Analysis

The objectives of this research were three-fold. The first was to establish the topical content of the program. What did the seniors and councilpersons talk about in their weekly discussion over the course of a year? Did the content change over time? We thought, for example, that discussion of municipal services might taper off as policy issues were brought up.

The second objective was a preliminary attempt to categorize the kinds of verbal interactions that occurred during the weekly discussions.[4] How many times did a senior citizen or a councilperson request information, give information, give opinions, or recommend action? Did these interactions change in degree or kind over the course of the experimental period?

The third objective was more evaluative: to what extent and in what way could the various categories be construed to measure changes in the relationship between the senior citizens and the councilpersons? Specifically, did the senior citizens become more assertive with their elected officials? Also, did the seniors develop any sense of age consciousness or group identification through their involvement with an interactive medium focused on the needs of senior citizens? Reciprocally, did the public officials become more responsive to the needs of the elderly as they interacted with them over time? To test the hypotheses we assumed that changes in the types of verbal interactions engaged in by both parties would indicate shifts in the relationship between senior citizens and councilpersons. Thus, the content and form of the discussions were observed over the year of weekly meetings as possible indicators of changes in the behavior of the seniors and the councilpersons toward each other in the context of an interactive television system.

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[4] See Appendixes A and B for a detailing of the content and interaction categories and a copy of the observational instrument.

Expectations for Senior Citizen Behavior

Our first set of expectations for changes in behavior are focused on the senior citizens. As the elderly interact over time with public officials, do their attitudes toward themselves and the public officials change as observed in their behavior? Do they become more assertive, more demanding of their elected representatives, more willing to give their own opinions?

Senior Assertiveness

It was hypothesized that initially the senior citizens would behave more as passive recipients of services and information, taking their cues from the councilpersons and simply asking for information and services rather than setting their own agenda. We predicted that they would behave more and more as agents or effectors as time went on, giving their own views and opinions, making suggestions, and perhaps confronting the councilpersons more directly about issues that concerned them. One assumption underlying this hypothesis is that the elderly would have the opportunity to see themselves on a par with elected officials who had appeared specifically to answer their questions. This creates a visual parity between the officials and the seniors, which could, with time, lead the elderly to a greater sense of their own power and a readiness to assert themselves more.

We hypothesized, therefore, that the number of senior interactions in the categories "requests information" and "requests service" would essentially remain stable over time.[5] While their requests for information might be fulfilled and their requests for service complied with, new knowledge and information could lead to further requests for information and service. We expected interactions in the categories "gives information," "gives opinion," "action recommended," and "argumentative/aggressive" to increase over time. One might also expect senior interactions in the content category of "policy for the elderly" to increase over time, as they gained more information to apply to policy considerations.

Senior Group Identification

It was also hypothesized that the elderly's reference group would become more identifiably that of "senior citizen" and that they would come to see themselves more as part of a group rather than as isolated individuals. This was based on an assumption that senior citizens tend to be socially isolated and that being old and retired is, for them, a new role with few guidelines other than usually negative stereotypes.[6] We thought that, as senior citizens discussed common problems over the two-way system, such as property taxes, housing ordinances, and crime, they would come to perceive themselves as belonging to a group with particular problems in common. As Cutler notes:

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[5] See Appendix A for a detailed description of the categories.

[6] See: B. Kahana, "Old Age Seen Negatively by Old as Well as Young" Geriatric Focus, 1970, 9, 1113; R. Kastenbaum and N. Durkee, "Elderly People View Old Age" in R. Kastenbaum (Ed.), New Thoughts on Old Age, New York: Springer, 1964; and National Council for the Aged, The Myth and Reality of Aging in America., Washington, D.C., 1975.

> "In the view of one sociologist, age consciousness is similar to class consciousness: while everybody objectively has an age and a class, all people do not identify with that age or class. Yet to the degree to which old people become aware of themselves as old, they may take on the politically relevant characteristics of a minority group or subculture." [7]

To actually *see* (via the interactive system) oneself physically in the presence of others as part of a group that has the unifying characteristic of being elderly should encourage and reinforce identification with that group. It should also reinforce one's perception of oneself as part of a whole, and not as an isolated individual. Moreover, the status and prestige associated with the existence of a special TV system just for the elderly may affect the negative stereotypes usually associated with old age. Therefore, it may become more attractive to identify with a reference group called "senior citizen" -- at least in Reading, Pennsylvania.

The category identified with the expectation of senior group identification is "senior/system power." One would expect the number of interactions by seniors in this category to increase over time if the interactive NCC system does indeed have an impact on reference group identification or on some sense of "age consciousness." General references to and discussion of the interactive NCC system itself ("System, General") could also be interpreted as an indication of group awareness. There were many comments about the NCC system and its importance to senior citizens during the fund-raising drive, as the termination of National Science Foundation (NSF) funds approached. These "group aware" comments did not necessarily refer to the power of the NCC system, but they very clearly exhibited an awareness of the system as a common resource that belonged to the senior citizens of Reading. "Save Our System" was their slogan during the fund-raising campaign.

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[7] See: N. Cutler, "Demographic, Social, Psychological and Political Factors in the Politics of Age: A Call for Research in Political Gerontology," *American Political Science Review*, 1977, 71, in press; M. Barron, "Minority Group Characteristics of the Aged in American Society," *Journal of Gerontology*, 1953, *8*, 477-482; and P. Ragan and J. Dowd, "The Emerging Political Consciousness of the Aged: A Generational Interpretation," *Journal of Social Issues*, 1974, *30*, 137-158.

Expectations for Councilperson Behavior

The expectation for change in the councilpersons' behavior over time can be characterized in terms of their awareness of and responsiveness to the needs and interests of Reading's senior citizens. (Any change can be interpreted either as a direct result of the medium or as a response to changes in the behavior of the senior citizens.) This expectation is based on two assumptions. First, the mere existence of the "Inside City Hall" program as a medium through which the elected officials and seniors could have the opportunity to talk with one another, would allow the councilpersons to become (more) aware of the concerns of senior citizens. Awareness implies the responsibility to do something about the problems over which they have administrative authority. This responsibility was made more salient by the public nature of the NCC system, which transmitted not only the content of what the seniors and councilpersons discussed, but also the nature of their interactions. Videotapes served as a "reviewable" record of these interactions.[8] To the extent that there are expectations that elected officials should be responsible to their constituency, one would expect the more public and less structured nature of "Inside City Hall" to result in a more responsive City Council.

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[8] In May 1977, video replays of "Inside City Hall" were shown at night, thus expanding the series from a day-time to a night-time audience. The councilpersons received phone calls specifically mentioning the evening replays and were impressed by the citizens' interest.

Also, our analysis of the videotapes revealed that the local politicians seemed quite aware of the power of the system, both in terms of their own accountability as well as the possibility of coverage to gain votes. When seniors registered complaints about services, the councilpersons often took notes and reported back later. As Cutler notes, not only are the proportions and absolute numbers of senior citizens increasing, but the notions of the elderly as necessarily disengaged from social activity and politically conservative, are closer to myth than reality.

In terms of the observation categories, then, one might expect increased responsiveness to be indicated by an increase in the following categories: "gives info," "action taken," and "policy for the elderly." It is also presumed that the number of "non-response" comments by city officials would decrease over time. Given: (a) the more immediate accountability of elected city officials to the residents of Reading and (b) the consistent and long-term nature of the two-way cable television forum, one might expect "non-responses" to become dysfunctional and even counterproductive for the councilpersons.

Methodology

Forty-six of the 49 "Inside City Hall" programs from January 1976 through February 1977 were analyzed by watching the videotapes of these programs. Each program was approximately 30 minutes in length. From January through September 1976, the interactive programming was available to the senior citizens attending the three neighborhood communication centers

(NCCs) as well as an additional 117 homes which were equipped with special converters that allowed them to view the programs and participate by telephone from their homes. As of September 1976, the interactive programming was carried over a regular cable channel and made available to the 35,000 subscribers to ATC-Berks Cable TV Co.

The subjects of the observations are the senior citizens and the city councilpersons who participated in the "Inside City Hall" programming. While the councilpersons appear on a rotating schedule, the senior participants effectively selected themselves, and thus are limited to those seniors who attend and participate verbally.

The instrument was developed over a period of several months with a number of field trials. Initial observations were made both in the field and on videotape to get a rough idea of appropriate content and interaction categories, guided by the assumptions stated earlier.[9] We then proceeded to develop an instrument that would accomplish three things: (1) account for both content and type of interactions in the city hall programs; (2) note the type of participant commenting - i.e., in-center senior, home viewer, and councilperson; and (3) enable the observer to simply mark the occurrence of the content topic, type of interaction, and type of participant without taking detailed notes. After several drafts we settled on the instrument contained in Appendix B.[10]

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[9] The basic unit of analysis is an "interaction." That is, it is a reference by speaker to a topic in a particular manner - e.g., a request for information about taxes or a statement of opinion about redevelopment. A change in topic, speaker, or type of comment would signal a new interaction.

[10] See Appendix B for an explanation of the coding process.

Descriptive Results

Participation

Data collected at the NCCs during January and December 1976 indicate that the mean attendance at all three NCCs combined during the "Inside City Hall" programming was approximately 25 senior citizens per program. An average of five (20%) of these seniors verbally participated in the discussion. In addition, the mean home-viewer participation was slightly more than two seniors per program. There was no significant change in in-center participants during the experimental period. However, the number of participating home viewers did increase significantly, more than doubling from the first (1.2) to the second (3.2) half of the experimental year. The increase in participating home viewers is probably explained by the fact that the programming went from a closed circuit status with only 117 home viewers to a potential cable audience of 35,000 homes in late September 1976 - in the middle of the second half of the experiment.

In sum, an average of more than seven senior citizens actively participated in discussion with the mayor and city councilpersons during each "Inside City Hall" program. Precise data on whether these seven seniors were the same individuals every week, or whether the composition of the group changed, and how much, is not available. However, we estimate that three or four people participated in the discussion every week; a few participated fairly regularly; and perhaps one was new each week.

In answer to the question "Who talked and how much?" we found that the participating senior citizens contributed approximately 1/3 of the total number of interactions. The councilpersons were responsible for about 1/2 of the total interactions and the home viewers accounted for a

Table 1

Percent of Interactions by Type and Person

	Seniors	Home Viewers	Councilpersons	Other	Total
Requests Info.	8.1	2.1	1.8	.1	12.1
Requests Serv.	1.2	.7	.03	.06	2.0
Gives Info.	9.1	2.9	26.3	1.9	40.1
Gives Opinion	13.8	3.9	14.7	.6	33.0
Action Taken	.2	.03	2.0	.1	2.3
Action Recm.	1.9	1.1	2.6	.3	5.9
Check/Refer	.03	0.0	1.8	.03	1.9
Non-Response	0.0	0.0	.7	.1	.9
Argu./Aggr.	.2	.06	.06	.03	.4
Other/Planned Action	.1	.0	1.1	.06	1.3
TOTAL	34%	10.8%	51.0%	3.5%	100.0%*

* Due to rounding, the figures do not total exactly 100%.

little over 10% of the discussion. The remaining 3.5% of the interaction the total interactions and the home viewers accounted for a little over 10% of the discussion. The remaining 3.5% of the interaction was accounted for by non-elected department heads, visitors to the system, and, occasionally, NCC system staff. Although contributions from the home viewers constituted a larger proportion of the total number of interactions during the second six months, the number of home viewers participating more than doubled. This is in contrast to the in-center seniors and the councilpersons, whose numbers of contributing persons and percentage of interactions remained fairly constant.

While the relative contribution of each type of participant remained relatively stable over time, the mean overall number of interactions in each program almost doubled from the first (42.8) to the second half (74.8) of the experimental period (see Table 2). We expected the kind of interactions to shift but did not expect the overall number of interactions to increase as dramatically as they did.[11]

Content

Table 3 gives the total number of interactions (seniors and councilpersons combined) in each content category. The category with the highest average number of interactions (14.6%) over all 46 programs was municipal "government and politics." This category included: talk of city hall and its workings and problems, political statements by the councilpersons, praise or criticism of the councilpersons and the city government by the senior citizens, and any questions, comments, or information on the city government or its representatives.

Of the remaining 19 categories, the following six assumed approximately equal importance -- from 7.1% to 8.7% of the total interactions: "street/traffic," "parks/recreation," "police/safety," "housing," "redevelopment," and "taxes." These categories encompass the essential urban services that the city provides plus the city's two major policy areas which affect the

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[11] These data may help to clarify some of the results from the sociological survey's Hypothesis 5 concerning increased interaction among the seniors (see Volume 2). The survey data show that housing projects with an NCC present showed a decrease in frequency of phoning neighbors, while those with no NCCs showed an increase in phoning. It is conceivable that the high levels of interaction during the programming act as a replacement for other types of social activity such as talking on the phone.

Table 2

Increase in Mean Total Number of Interactions Per Program from the First to the Second Half of the Experiment

	First Six Months	Second Six Months
Requests Info.	6.6	7.9
Requests Service	1.3	1.2
Gives Info. ($p < .0005$)	17.3	30.5
Gives Opinion ($p < .0005$)	10.6	28.4
Action Taken	1.5	1.3
Action Recommended	3.6	3.5
Check/Refer	1.4	.9
Non-Response	.5	.6
Argumentative/Aggressive ($p < .05$)	.04	.46
TOTAL[a]	42.84	74.76

[a] Includes in-center seniors, home viewers, councilpersons, and others.

elderly: taxes and urban renewal. These six categories, added to "government and politics," account for 61.2% of the interactions on "Inside City Hall."

The "other" category demonstrates that subjects other than the listed categories were discussed. Included in the "other" grouping were references to the following topics: national and state issues, health organizations, federal funding, consumer problems, technology, supermarkets, utilities, athletics, and sanitation. Some interactions, e.g. jokes, personal

Table 3

Content Categories: Percent each was Discussed, from Mean Number of Interactions per Program over all 46 Programs

	Mean Number of Interactions Per Program	% of TOTAL
Municipal Services: (57.9%)		
Street/Traffic	4.89	8.2%
Sewer/Water	3.5	5.9
Park/Recreation	4.24	7.1
Fire	2.46	4.1
Police/Safety	4.76	8.0
Transportation	.41	1.0
Education	.17	.3
Housing	4.33	7.2
Redevelopment	5.22	8.7
Taxes (prop./munic.)	4.44	7.4
Other Municipal: (19.6%)		
Government and Politics	8.72	14.6
Policy for Elderly	.65	1.1
Budget and Finance	2.33	3.9
System Comments: (5%)		
System (general)	1.59	2.7
Senior/System power	.52	1.0
References to other programs	.8	1.3
Other: (18.3%)	10.79	18.3
TOTAL	59.82	100.0%*

* Due to rounding, the figures do not total exactly 100%.

comments, opening and closing statements, were not counted at all unless they had direct relevance for one of the listed categories.

Of the total number of comments made by each group (in-center seniors, home viewers, and councilpersons) in the weekly discussions, the proportion in each content category is relatively similar across groups. For example, the percentage of each group's total number of comments about "government and politics" ranged from 13.5% to 16.8%. The home viewers made relatively more comments about "street/traffic" and "police/safety" than did the other two groups, but, essentially, no one group monopolized any particular content topic. Given the interactive nature of the NCC system, this is not surprising. When any particular content topic is brought up, all groups usually participate in the discussion about it.

As would be expected, Reading's commission form of government (in which each councilperson is responsible for specific municipal services) led to differences among councilpersons as to the content areas discussed. There were more interactions about "street/traffic" and "sewer/water," when the councilperson who had responsibility for these services was on, than when any of the other councilpersons were participating.

Interaction

Of all the types of interactions rated for all persons, the two most frequently observed, by far, were "gives information" and "gives opinion," with 24.2 and 19.91 mean number of interactions per program, respectively. Together, they constituted 73.1% of the total interactions. The next highest type of interaction observed was "request information" at 7.3 (12%) interactions per program (see Table 1). As might be expected, the pattern of types of interactions is somewhat different between the seniors/home viewers and the councilpersons. For both the in-center seniors and the home viewers, "gives opinion" was the most frequently occurring interaction category, representing 39.7% and 35.5% of each group's total interactions. "Gives information" was second (26.3% for seniors and 26.5% for home viewers); and "requests information" was third (23.5% for seniors and 19.4% for home viewers). By contrast, "gives information" accounted for 51.6% of the average councilperson's total interactions, while "gives opinion" was only 28.8% of the total and "requests information" a mere 3.4% of their total interactions.

In a sense, these figures are not surprising. One would expect the councilpersons, the experts on city services and procedures, to give out more information than the seniors. However, the seniors and home viewers do contribute approximately 30% of the total "gives info" interactions, with the councilpersons contributing 65.5%. Also, almost 40% of both in-center senior and home-viewer interactions were "gives opinion" while only 29% of the councilpersons' interactions were of the "gives opinion" category. This might be in response to the tendency for the councilpersons to be asked for information they have instead of opinions they might hold.

Hypotheses

Expectations of Senior Behavior

Senior Assertiveness: The data partially support the first hypothesis that the seniors would move from acting as recipients of services and information to acting more like effective agents, asserting their own views and opinions. Of the five categories[12] expected to show change over time as a measure of increased senior citizen assertiveness, four show a significant change in the predicted direction: "gives information," "gives opinion," "policy for the elderly," and "argumentative/aggressive" (see Table 4).

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[12] Each category having separate scores for in-center seniors and home viewers.

"Requests information" and "requests service" were expected to remain stable. That is, as the senior citizens received information and services, we expected them to ask more informed questions and request different services.[13] Thus, the level of requests would remain relatively stable. For example, one senior citizen said to a councilperson "I enjoyed your answers, but they were not sufficient," implying continued questioning. The data show a relatively stable level of interaction over time in these two request categories. Home-viewer requests for information actually increased significantly, but this may be because large scale home viewer entry onto the system occurred during the second half of the experimental period. The significant increase may represent both a larger number of home viewers as well as their initial interest in information.

The five categories which we expected to increase in number of interactions fall into two natural groupings: (1) gross, general indicators of active participation in the discussions -- "gives info" and "gives opinion," and (2) more refined, higher level indicators of more specific actions indicating assertiveness -- "action recommended," "argumentative/ aggressive," and "policy for the elderly." The more general indicators show a highly significant increase in number of interactions while the

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[13] Findings from the before-and-after survey of senior citizens show an increase in statements about awareness of the political process (see Volume 2). In response to a question about how to get the city and government to pay attention to the needs of the elderly, the Wave II responses were more specific than the Wave I responses which had more "don't know" responses.

Table 4

Change Over Time in Senior Citizen Assertiveness
As Measured by Mean Number of Interactions
In Observation Categories

	First Six Months	Second Six Months
Hypothesized		
Requests Info.		
srs (n.s.)	4.6	5.2
hvrs ($p<.01$)*	.6	1.9
Requests Service		
srs (n.s.)	.8	.6
hvrs (n.s.)	.3	.5
Gives Info.		
srs ($p<.0005$)	3.5	7.3
hvrs ($p<.0005$)	.7	2.7
Gives Opinion		
srs ($p<.0005$)	4.7	11.6
hvrs ($p<.0005$)	.8	3.8
Action Recommended		
srs (n.s.)	.9	1.4
hvrs (n.s.)	.5	.8
Argumentative/Aggressive		
srs ($p<.05$)	0.0	.3
hvrs (n.s.)	0.0	.1
Policy for Elderly		
srs (n.s.)	.14	.33
hvrs ($p<.025$)	0.0	.33
Unexpected		
Government/Politics		
srs ($p<.0005$)	.9	6.0
hvrs ($p<.005$)	.1	1.7
Budget/Finance		
srs ($p<.025$)	.2	1.0
hvrs (n.s.)**	0.0	.2

* $p<.01$, but in the wrong direction

**p approaches .05

higher level and more specific indicators show very little change over time. However, "argumentative/aggressive" did increase for seniors ($p < .05$) and "policy for the elderly" increased for the home viewers ($p < .025$).

It should be noted that the higher level indicators were among those interaction categories with the lowest reliability coefficients. This is related to the relatively small number of interactions occurring in these categories. "Action recommended" had an alpha coefficient of .77 for the in-center seniors and -.25 for the home viewers. "Argumentative/aggressive" had alpha coefficients of .63 and .58, and "policy for the elderly" had alpha coefficients of .19 and .69 respectively. Therefore, the apparent lack of proper definition of the categories may have adversely affected the possibility of measuring real change in these three categories. Also, the very few ocurrences of interactions in these categories may have affected the reliability coefficients adversely. In contrast, both the more general categories, "gives info" and "gives opinion," had relatively high reliability coefficients: .93/.96 and .93/.81 for the in-center seniors and home viewers, respectively.

There were some unexpected changes in the elderly's behavior that could be interpreted as support for the general hypothesis that the seniors would become more assertive over time. There was a highly significant increase in the number of interactions by senior citizens in the category of "government and politics."[14] This suggests a greater interest in the processes of municipal governance than in specific service delivery problems. Rather than simply focusing on particular issues, they became more aware of and concerned with the overall workings of local government.

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[14] Alpha coefficient is .92 for in-center seniors and .77 for home viewers.

The content of statements by the senior citizens indicates that they held the city councilpersons responsible for their actions. For example, one senior criticized the councilperson responsible for street maintenance for not having made sure that the crosswalks were clear of ice during a winter storm. As a result, an elderly woman slipped and was hit by a truck. In the exchange over this incident, the senior pointed out the councilperson's responsibility in the matter and noted that a politician should be able to admit to error. The councilperson responded that he wasn't a politician. The senior then said that a politician was someone who had a political job -- and it was no sin to be a politician. No one was immune from making mistakes. The point here is that the senior was holding this councilperson accountable as his representative in the government. Another senior said, "We admire councilperson 'X' for her straight answers."

The other area that shows an unexpected trend toward significantly increased interactions by the seniors is "budget and finance." This may have been due to an increase in the elderly's awareness of the importance of the city's financial problems. The fact that municipal finances were an important item on the "public agenda" of the community during the experiment may also have accounted for the increased interactions. At one point the seniors, fearing their property taxes would rise, were very concerned about the prospect of a reassessment of city property taxes. The councilpersons explained that the City Council was in favor of property reassessment because they felt that there were unfair differences between city and county property taxes. Consequently, the purpose of the reassessment was to determine whether the city row houses were shouldering a disproportionate share of the property tax burden.

Later in the same program, one senior congratulated the effort of the city council to correct mistakes from the past - especially on financial issues. As the seniors became more informed about issues that concerned them, they became more aware of the importance of understanding budget and finance. The reliability coefficient for "budget/finance" is .81 for the in-center seniors and -.25 for the home viewers.[15] It is not clear whether more reliable data would have resulted in a more significant trend for this particular category.

Group Identification

The second general expectation about the impact of the NCC system on the senior citizens -- that they would become more "age conscious" or aware of themselves as part of a group -- was not supported by one of the categories used to tap this dimension. Comments about "senior/system power" show no increase over time (see Table 5).

Table 5

Change Over Time in Senior Citizen Group Identification
As Measured by Mean Number of Interactions in Observation Categories

	First Six Months	Second Six Months
Senior/System Power		
Seniors (n.s.)	.5	.3
Home Viewers (n.s.)	0.0	.1
System (general)		
Seniors ($p < .05$)	.04	1.5
Home Viewers (n.s.)	0.0	.2

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[15] The negative coefficient for the home viewers is the result of a number of zero variance items across the eight programs the observers watched.

"System (general)" comments by seniors did, however, increase significantly from the first to the second half of the experimental period. This was influenced by a number of discussions in the last few months of the experimental period about "saving our system." The seniors talked about the end of federal funding and asked for viewer support. Contributions were solicited and sent. People living on limited, fixed incomes contributed money, sometimes more than once. The amounts received from the seniors usually ranged from $1-$25. One NCC organized a fund-raising luncheon and raised over $500. Seniors sent in letters and testimonials talking of the importance of the NCC system in their lives. To the extent that the interactive system was identified as "our" system, the senior citizens of Reading who knew that the two-way cable was explicitly for senior citizens must have seen themselves as part of that group.

Again, the higher level category "senior/system power" required explicit mention of the power of senior citizens or of the NCC system and is therefore less likely to appear than a more general category like "system (general)."[16] This does not mean that comments of this sort did not appear. To the contrary, it was pointed out to one councilperson that there were 150 fans on the system who were paying attention to what did or didn't happen.[17] With reference to taxes and the school board, one senior noted that the senior citizens were on their toes. Another senior referred to the "gray panthers" being ready to pounce. Although such comments occurred they didn't increase over the experimental year.

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[16] The alpha coefficient for "senior/system power" was only .62 for seniors and .75 for home viewers; while the alpha coefficient for "system general" comments was .98 for seniors. There was none for home viewers because of zero variance items.

[17] This occured before the opening of BCTV to all of the Berks Cable subscribers.

Expectations of Councilperson Behavior

Of the three categories expected to show a change in councilperson responsiveness, only "gives information" showed a significant increase over time (see Table 6). "Action taken" and "policy for the elderly" show no significant change at all, and the "non-response" category did not exhibit a decrease in number of interactions.

The obvious difficulty here in talking about "responsiveness" is that these data consist of overall sums of behavior and not linked action-response pairs. Also, the councilpersons may have actually been more responsive,[18] but the categories selected did not pick up this dimension. For example, the mayor noted that more policemen were reassigned to foot-patrol duty as a direct response to a request from senior citizens. The peril for pedestrians in front of a senior citizen highrise that lacked a one-way street sign was pointed out and remedied within two weeks. This event was documented on the system and the councilperson was lauded for the efficiency of her response. The city planning department incorporated into its final design seniors' suggestions for a small park next to a senior citizen highrise. These suggestions originated in one of the "Inside City Hall" programs. In general, the councilpersons frequently requested input and feedback from the senior citizens.

Like the seniors, the councilpersons did significantly increase their interactions by giving their opinions and discussing "government and politics" and "budget and finances" more over time. One assumes that this was in response to senior interactions, though it is unclear who initiated and who responded. We know that whoever did the "initiating," the seniors and councilpersons certainly sparked each other into more and more interaction.

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[18] Findings from the survey research show that the senior citizens in experimental areas perceive the government officials as being more responsive to their demands (see Volume 2).

Table 6

Change Over Time in Councilpersons' Responsiveness to Senior Citizens, As Measured by Number of Interactions

Hypothesized	First Six Months	Second Six Months
Gives Information ($p < .0005$)	11.1	20.2
Action Taken (n.s.)	1.3	1.1
Policy for Elderly (n.s.)	.14	.29
Non-Response (n.s.)	.3	.6
Unexpected		
Gives Opinion ($p < .0005$)	4.5	12.8
Government/Politics ($p < .0005$)	1.1	6.9
Budget/Finance ($p < .005$)	.4	2.7

Overall Interaction

While the total number of interactions almost doubled, specific types of interactions increased selectively (see table 2). This lends support to our initial assumption that types of interactions could act as a barometer of change over time.

Table 7 gives those categories which show a significant increase over time for all persons. People were giving their opinions and information more and becoming more argumentative and aggressive about that which they were asserting. One could argue that having a forum in which to express themselves was only the initial impetus to interaction between the participants. The special nature of this medium further encouraged contributions from people in a way that emphasized equal and active participation by all parties.[19]

Table 7

Citizen Government Programming: Changes in Type and Content of Interactions Over Time

	Mean Number of Interactions Per Program	
Type of Interaction	First Six Months	Second Six Months
Gives Information ($p < .0005$)	17.3	30.5
Gives Opinion ($p < .0005$)	10.6	28.4
Argumentative/Aggressive ($p < .05$)	.04	.46
Contents of Interaction		
Local Government and Politics ($p < .0005$)	2.4	14.5
Two-Way Cable System ($p < .05$)	.2	2.8
Municipal Budget and Finance ($p < .005$)	.7	3.8
Policy for Elderly (p approaches .05)	.3	.96

People became quite free not only in giving their opinions, but in offering items of information that they had gleaned from one of the programs or, of course, through independent sources. One senior citizen corrected a councilperson about the nature of a transfer of property to a city department. Inspired by a discussion on an earlier program, she had checked it out herself with the department head. The important points here are that the seniors felt they had information and opinions worth listening to and a forum in which to offer them. The councilpersons were equally actively engaged in the interaction, not only in giving information but also in receiving it.

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[19] It is important, if not essential, for anyone interested in the Reading project to see a sample of the taped programs to get a vivid sense of the informal and vital nature of the interactions that took place. With reference to this report, there is a composite tape of selections from "Inside City Hall" available from the Alternate Media Center, School of the Arts, New York University.

Qualitative Observations

While some of the linkages between the hypotheses offered and the data on citizen/government interaction must remain tentative,[20] the interactive cable programming has had two clear consequences: (1) it has created a convenient, direct, and highly accessible setting for senior citizens to communicate with public officials; and (2) the officials value and recognize the importance of this direct means of public participation. The two-way cable system has provided the time, space, and framework for these discussions to occur, but the participants involved have used that time to address their needs and to respond to each other. What started as an "experimental" TV program has generated and maintained its own dynamic which will continue to evolve over time. The two-way cable TV system, which was taken over by a local board at the end of the experiment, is now called Berks Community TV (BCTV). Qualitative observation of the "Inside City Hall" programming, and continued use of the interactive system for citizen/government interaction demonstrate the effectiveness of the system as a means for citizens to participate in municipal affairs.

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[20] This has been a preliminary exploration of the effects of the interactive TV medium which needs more refined follow-up. For example, the measures used in the observations may not be adequate to tap the dimensions of power or age-consciousness.

The senior citizens have been quite explicit about recognizing and appreciating the novelty of direct access to their elected representatives. One home viewer who called in said, "It's nice to see you face-to-face." Obviously the councilperson could not see this person, but as far as the home viewer was concerned, she was acting as if she were in a "face-to-face" exchange. Another in-center participant once commented, "Before BCTV, I could talk to the President before I could speak to a councilperson."

In a discussion about the possibility of developing a local television station in Reading one senior citizen said, "But if there is a local TV station, what will happen to us...talking to each other?" The councilperson responded that a local broadcast television station simply could not replace the interactive sessions between the councilpersons and the senior citizens. Their discussion would continue. This was not an isolated instance of the city council's support of BCTV. Its importance to them has been openly acknowledged in very concrete ways. For example, during the fall 1977 city council election campaigns, one candidate pledged $25 a month to BCTV if he were elected. He was elected and BCTV regularly receives his contribution.

In November 1977, the council held its annual budget hearings which, by law, are open to the public. Prior to the hearings the city council requested from BCTV live evening coverage of the hearings. They stressed particularly that they wanted to emphasize the interactive nature of the hearings. Hensler Homes (the site of an existing NCC), a local high school, a branch library, and city hall were used as gathering places, while the discussions were also cablecast to all the Berks Cable TV subscribers. Eighteen people participated verbally in the centers. Seventeen home viewers called in, and ten additional home viewers were backed up on the phone lines waiting to participate during the two-hour hearings. The numbers are only impressive in comparison to another set of hearings held by the county commissioners the same week in a public meeting place. Nobody came.

The councilpersons were enthusiastic about the responses and left the hearings discussing the possibility of allocating funds to support BCTV. Partly as a result of the hearings, and to reach a broader audience, "Inside City Hall" was moved to an evening time slot at the request of the city council. This qualitative documentation tends to support the research findings about more senior citizen assertiveness and councilperson responsiveness as a result of the BCTV operations.

CHAPTER 3

Summary and Conclusion

This chapter summarizes the findings of the content analysis of the "Inside City Hall" programs and describes the ways in which public officials perceived the impact of the two-way cable programs. The particular attributes of the Reading cable project which facilitated citizen feedback to local government officials are discussed and the implications for other urban communities are analyzed. Finally, alternative uses of interactive cable television for citizen participation in the delivery of urban services are identified.

The "Inside City Hall" programs provided an opportunity for citizens and local government officials to communicate on a regular and recurring basis. Both citizens and public officials developed skills in communicating over the course of the experiment. Participants expressed their opinions and gave information more frequently as well as becoming more assertive in stating their positions.

Senior citizens, in particular became more assertive in their comments and showed significant increases in the number of times they stated their position, advocated specific action, and proposed policies for the elderly. For elected officials, the interactive cable programs helped to accomplish one of their essential functions. Communication with constituents is a basic element of the job; the process of speaking through two-way cable television to citizens provided a convenient and reliable means of "staying in touch" with voters and demonstrating responsiveness to the constituency.

Six categories dealing with basic urban services (street/traffic, sewers/waters, parks/recreation, fire, police/safety, and housing) accounted for one third of the total interactions. Taxes and redevelopment, two urban policy issues of importance to the elderly, accounted for 16% of the total interactions. It is important to note that the total number of interactions almost doubled between the first six months and second six months of the experiment. This suggests greater efficiency in conducting programs and increased participant skills in structuring the discussions.

Comments about local government and politics and municipal budget and finance increased significantly between the first and second six months of programming. As the experiment proceeded, the focus of the discussion moved from an emphasis on specific problems to general issues of governance. Although it was not possible to systematically identify the relationship between public issues in the overall community and those discussed in the cable programs, the programs tended to reflect issues on the city's public agenda. During the second half of the experiment, tax reassessment was a major municipal issue and given its salience to elderly citizens living on fixed incomes, the NCC system provided a forum for senior citizens to communicate their views.

The intensive discussion of municipal taxes and finance demonstrates the potential of interactive cable television to serve as a highly sensitized feedback system. Senior citizens' apprehension over an anticipated tax increase was easily converted into direct communication with elected officials. Citizens directly voiced their concerns to local officials without relying on an external political organization or group. The form of this citizen feedback was also qualitatively different than a series of _ad hoc_ messages from individual citizens. Further, the cable programs provided a means to convey the response of elected officials directly to citizens.

Theoretically, it was possible that neither citizens nor elected officials would fully use the "Inside City Hall" programs as a citizen feedback mechanism. The elderly could have been passive viewers and city councilpersons could have talked without any substance but in official ways. The factors which produced the pattern of communication between citizens and elected officials over the cable system are thus important to recognize. These factors are: 1) the size of Reading and the structure of the municipal government; 2) the role of citizens in coordinating the cable programs; and 3) the properties of the interactive medium.

Reading's modest size (pop. 87,643) and its relatively high proportion of senior citizens made it possible to use cable on a city-wide basis to reach a distinct sub-group of the population. The city's modified commission form of government in which council members exercise both legislative and administrative duties was a particularly important factor; local government officials in Reading combined direct accountability to the electorate with direct administrative authority over municipal policies and programs. Hence, citizens could talk with elected officials who were accountable to them and had the power to respond to their concerns. Citizen feedback could be easily integrated into the existing governmental structure. Citizens' comments did not need to go through an external party such as an ombudsman or legislator, who must transmit the message to the appropriate administrator and then follow up to see what action was taken. Further, it allowed citizens to talk with officials at the "top" rather than at the bottom of the administrative hierarchy.

For the elected officials, the cable programs provided an opportunity to demonstrate responsiveness and develop voter support in the community. When asked about such neighborhood problems as street repair or the installation of a stop sign, local politicians either initiated steps that satisfied citizen demands or explained why the requested action could not be taken. In matters where elected officials were not familiar with specific issues, they would try to get the necessary information and convey it during their next program. When complaints involved state or federal policy, local politicians were, not unexpectedly, more than willing to identify another unit of government as the source of the problem.

By having senior citizens produce and serve as moderators for the interactive programs, the citizens, rather than the public official, determined the content of the discussions. Public officials were not in control of the programs, citizens were. Thus, the likelihood of having one-way communication from politician to citizen was reduced and the opportunity for a "give and take" discussion was enhanced. The use of community based centers as origination sites for cable programs also influenced the pattern of interaction. The existing neighborhood centers provided a familiar and non-institutional site for citizen participation. The mere fact that citizens could communicate individually and as a group from their own neighborhoods in an informal setting affected the nature of citizen feedback to public officials. In contrast to public hearings or meetings held in government offices, the neighborhood center provides a supportive group context for citizen participation. Further, the time and cost of getting people to assemble in one central place on a weekly basis is reduced by relying on neighborhood-based centers.

The visual properties of the interactive medium facilitated communication in which elected officials could not manipulate physical space and objects to symbolize their status. Citizens and officials were visually equal on the split-screen of the cable programs and shared the common space of the interactive medium. There was no stage or rostrum to separate the public officials from the citizens as is usually found in large public meetings or hearings.

Related Survey Findings

Findings from the panel survey of senior citizens which drew upon all interactive programs, indicate that the experimental cable system affected senior citizens' awareness of local issues and sense of political efficacy.[21] Citizens in the experimental groups were more able to identify local problems in Reading than those in the control groups. In addition, there were larger increases in the percentage of the experimental population (located in residential projects) who considered officials to be responsive to their needs than in the comparable control groups. In particular, residents in two sites where NCCs were located (Hensler Homes and Kennedy Towers) showed larger increases in the percentage of respondents who believed public officials actually "do something" when a citizen speaks up and larger decreases in those who felt officials "pay no attention," than comparable control groups. Thus, the interactive cable system may have contributed to the senior citizens' belief that public officials are responsive to their needs and interests.

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[21] For a detailed analysis of the survey findings, see Volume 2.

The two-way cable programs also provided the basis for mobilizing the elderly as a political group. Senior citizens became more aware of their group power and of the importance of collective action in political processes. The belief that "older persons in Reading usually stand up for their rights," rather than "give in too easily" increased in all experimental groups while none of the control groups showed an increase. Moreover, two of the four experimental groups showed increases in the percentage who felt collective action is the best way for older persons to get the city and the government to pay attention to the needs of the elderly. When asked whether senior citizens needed their own organization "to look out for their needs and rights" three of the four experimental groups showed larger increases in the percentage who felt such organizations were needed to gain greater power than those in comparable control groups.

Implications for Other Communities

The experience in Reading suggests that two-way cable television can serve as an effective means of citizen involvement in local political processes. It provides a channel for citizens to communicate with each other and with public officials about community problems and issues. Although broadcast television has increased the capacity of citizens to identify issues and acquire information on national and international affairs, there are few mechanisms available through which citizens can directly act on such information. Interactive cable television can heighten citizen awareness of community problems and improve access to decision-makers at the local level, where the opportunities for direct participation are theoretically far greater than at the national level.

Findings from the Reading project indicate that it is possible for citizens and public officials to use interactive cable television as a regular means of communication. Whether public officials in other cities would be willing to meet regularly with one or more groups of organized citizens over cable television is not known. Clearly, senior citizens have particular preferences and limited mobility which enhances the attractiveness of cable as a mechanism for them to participate in local government. Further, they are a non-threatening political group; it is unlikely that local officials will be as willing to communicate on a regular basis with other urban political groups over cable. Clearly, if every age, racial, or ethnic group in large cities sought to hold weekly meetings with public officials over cable television, neither the cable system nor the officials would have the capacity to effectively respond to citizen demands.

Therefore, the use of cable television for citizen participation must depend upon the size and scale of urban political institutions and on the basis by which local groups are organized to participate in local politics. In some cities, it may be necessary to structure interactive programming according to spatial groups rather than ethnic or age groups. Neighborhood-based cable programs can allow a community to communicate with itself and with the appropriate public officials. An interactive capability at the community level would allow numerous political activities to be conducted over cable television. Citizens would have direct access to local officials, such as state legislators, city councilpersons, and local administrators of service delivery organizations. Low-cost political advertising for local candidates could also be conducted over cable.

In cities where the problems of urban governance are qualitatively different than in a city such as Reading, different formats for interactive programs will, of course, be required. Administrators of municipal departments could jointly participate with the appropriate city legislators in programs with local citizens. Programs could be organized according to specific municipal issues such as finance, public safety, or city planning. Citizens could then communicate with both elected and appointed officials responsible for a given municipal function. In large cities, high-level administrators and elected officials could participate jointly in interactive programs, similarly organized by specific topics such as finance, public safety, or city planning. The relevant appointed and elected officials, such as the budget director, city controller, and head of the legislative finance committee would individually and collectively respond to citizen questions, comments, and demands.

Public hearings of city wide agencies, such as the planning commission, could also be conducted over cable television. Citizens could participate from dispersed locations throughout a municipality. Community groups could use videotapes to aid in the documentation of their position just as professional consultants use slides and charts. There are an enormous number of local participatory activities that could be effectively conducted over cable television. There has been much attention given to the use of communication technologies to improve "economy and efficiency" in the management of public agencies. Relatively little consideration has been given to exploring ways to facilitate direct citizen feedback through two-way cable television.

The Reading cable experiment demonstrates that interactive cable television can provide a powerful means for citizens to articulate their preferences for public goods and services to municipal officials. This is clearly an important use of cable which should be systematically considered in designing public service uses of cable television. Further research is necessary to determine the types of municipal services and administrative agencies which are most suitable for interactive communication between citizens and consumers. Much remains to be known about the application of cable to large cities with different service delivery problems.

The role of cable television as a medium of communication within urban communities is especially important given the limits of broadcast television and metropolitan newspapers as sources of local information. Television, as it is presently organized, is especially biased towards the mass viewing audience as it exists both on a national level and within a region. The number of channels is limited by the number of over-the-air broadcast signals that can be transmitted through the electromagnetic spectrum in a given region. In the very high frequency range (VHF), only 12 channels are available and adjacent channel interference prevents the use of more than seven channels within the same area. The ultra high frequency range (UHF) ostensibly provides a larger number of channels but the actual use of UHF has been severely hampered by a variety of technological and economic factors.

The commercial foundation of broadcast television leads to reliance on advertising for financial support. In order to attract advertisers, television programming is designed to reach the largest possible audience;

the result is mass-oriented television which can offer only "token" programming to those persons and groups whose preferences diverge from the majority. This eliminates the possibility of television programming on neighborhood problems and community issues within large metropolitan areas. Like television, newspapers depend upon advertisers who want to reach affluent consumers. As the middle class has moved from the central city to the suburb, the metropolitan daily has had to broaden the geographical scope of its coverage. As Ben Bagdikian notes, "The competition to get into as many affluent households as possible has pushed newspapers and broadcasting stations into wide-area distribution. Economies of scale in mass production make it simpler to cast the net wide and then identify for the advertiser the harvest of high-consumption households. The result is that metropolitan broadcasters and papers cover enormous geographic areas."[22] The consequences of such a media orientation are particularly severe for the low-income and minority groups located in the central city. Neither the newspapers nor the television stations have an incentive to report on events in their areas. Thus the economically poor become the information poor as well.

For all income groups, the imbalance between the scale of the media audience and the size of local government units has serious implications. As Bagdikian states:

> "The average county in the United States has 26 local governments, of which 22 have taxing power and five are school districts. Even if they ignored all other community news--unofficial organizations, crime, sports, public events--this means that the typical metropolitan paper and broadcast station,

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[22] Ben Bagdikian, "Mass Scale and Community Boundaries," paper presented to the Annual Meeting of the American Association for the Advancement of Science, Washington, D.C., February 1978.

> with news jurisdiction over 1300 local public policy-making bodies, cannot report the deliberations and decisions of these bodies in any systematic or thorough manner. If each policy-making body met once a week and a metropolitan television station reported on nothing else, in a typical half-hour newscast, each meeting would warrant 5.49 seconds per week, or at 180 words per minute, 16.47 words per week.[23]

In contrast to broadcast television and large daily newspapers, cable television has the technical and economic capability to provide information and services oriented towards the diversity of interest groups and communities that comprise the metropolitan area. In an era when information plays an increasingly important role in public policy-making, cable technology makes it possible for individuals and groups at the local level to have their own means of electronic communication. By strengthening citizen access to and control over information, cable television enhances the ability of citizens to communicate with public officials and to participate effectively in urban political processes.

APPENDIX A

Interaction Categories

Requests information: from anyone, on any topic - e.g., a senior citizen could have requested information about property taxes, where to get forms, or how the city council arrived at a particular decision. In addition, a councilperson may have requested more detailed information about a problem expressed by a senior, or even the name and address of a home viewer in order to personally respond to a complaint.

Requests service: usually involved the more physical aspects of city maintenance - e.g., garbage collection, street lights, water service, maintenance of parks, housing safety. Included in this category were clearly stated requests for service, "When are you going to fix that light on my street." Implicit requests for service were also embedded in giving information, "There is a light out on my street and we're afraid at night." This would have been coded for both 'gives information' and 'requests service.'

Gives information: the inverse of requests information, from anyone, on any topic - e.g., when a senior gave the location of a pot hole or unpainted apartment or the license plate of a police car that parked in bus stops.

Gives opinion: e.g., "I don't think its fair that we have to pay school tax." We tried to distinguish between when a councilperson was giving information and giving his/her opinion. Often there were verbal clues -- "in my opinion....personally....I think...." but sometimes there were not and a judgement was made.

Action taken: most often referred to actions already taken by councilpersons in response to a request for information or service. It was also a response to a follow-up question on a promised action. Occasionally, a senior had taken responsibility for doing something that was reported during the program, or a councilperson suggested an action that had already been tried by the senior.

Action recommended: most often applied to councilpersons but utilized by seniors also; e.g., "You should write or call Mr. X and he will help you" or "call me next week and I will check on it in the meantime," or from a senior, "Why don't you turn that building into senior citizen housing instead of selling it to the community college?"

Check/refer: by councilperson; "I will look into that" or "I will refer it to Mr. X, that is his department."

Non-response: by councilperson; a response that does not answer a question by missing the point and responding to something else, obfuscating it, or simply changing the subject.

Argumentative/aggressive: a very subjective category in principle, so we tried to limit interactions in this category to obvious confrontations, standoffs, persistent arguing, not accepting a statement, and obvious challenging; e.g., "I think you have an obligation to admit it when you are wrong" or "I disagree with you and I won't discuss it anymore."

Planned action: This started out as an "other" category and was changed midway in the observations to "planned action." It was often used in response to a request for service or information by a senior. Action has not occurred on an issue but is planned to occur. "We are going to take that up at council next week" or "We hope to get this bill passed/ordinance changed."

Content Categories

Municipal Services

The municipal service categories are self explanatory. Coding decisions arose when a comment was made, for example about safety in the parks. If it was evident that the focus was safety and not the parks, the comment would be coded in "safety." However, ambiguous cases did occur and a judgment had to be made. If there were two ambiguous comments, one was coded in safety and the other in parks.

Other Municipal

Government and politics. Included references to the workings of city hall per se, municipal elections, praise or blame of councilpersons, the difficulties of elected office, etc.

Policy for the elderly. Was to include specific policy statements about the elderly; e.g., "Seniors should be exempt from school tax."

Budget and finance. The city budget and talk of funding for city projects.

System Comments: Because of the innovative and unusual nature of BCTV, we wanted to pick up on explicit comments about the two-way cable TV system itself as possible indications of how people experienced it and their general awareness of it.

System--general. Included comments about the running of the system, its very existence, technical aspects, references to the staff.

Senior/system power. Any mention of the potential power of the medium or power of the seniors themselves as an expression of the power of the medium.

References to other programs. Comments about or references to any other BCTV programming.

Other. Content areas not included in the above; e.g., national and state issues, health organizations, federal funding, consumer problems, technology, athletics.

APPENDIX B

Approximately five or six of the observation sheets were used per program, one sheet for every five or six minutes of interaction. The content is identified by the row and the type of interaction is by column. The type of speaker is identified by number. If, for example, a senior citizen requested information about taxes, a "1" would be put in the box at the intersection of "taxes" and "requests information." If the councilperson responded with the information, a "3" would be put in the "taxes" box under "gives information." Since the instrument as devised calculates only total number of interactions in each category, a rough idea of the give and take of sequencing of the conversation was accounted for by brief notes at the bottom of each page. Therefore, we ascertained a three-way identification of each verbal presentation -- topic content, by type of speaker, by type of interaction.

The basic unit of analysis is an interaction. An interaction is a reference by a speaker to a topic. Often, more than one interaction was represented within one person's verbal presentation. Therefore, the unit of analysis, the interaction, was essentially the category as it defined itself within a speaker's presentation; in other words, the smallest discriminable unit, which is not necessarily time-bound.* For example, a home viewer might call in and speak for 30 seconds, stating his or her opinion on safety in a housing project. After a response by the councilperson, the home viewer could spend another 30 seconds talking, during which she might "give some information" about safety, "request a service" about safety, and thank the councilperson for the good job he is doing ("gives opinion" about "government and politics"). Each type of interaction for this one person would be marked separately.

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*For a general discussion of observational methods, see K. Weick, "Systematic Observational Methods," in Lindzey, G. and Aronson, E. (Eds.), The Handbook of Social Psychology, 2nd ed., Vol. 2. Reading, Mass.: Addison-Wesley Publishing Co., 1968.

As the program proceeded, the observer would indicate by number, in the proper intersection, who is speaking, about what, and in what manner. A change of speaker, topic, or type of interaction would signal a new mark. Not accounted for were such things as introductory and closing remarks (unless they contained a content topic) and informal conversation that did not cover a topic code. In short, very few interactions were excluded from the observations. The total number of interactions was calculated for each category (content and type of interaction) in every program. Also subtotals were calculated in every category for seniors, home viewers, councilpersons, and others.*

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*"Other" persons are not discussed in the analysis but remain in most of the tables to preserve the integrity of the data.

APPENDIX B

(continued)

Inside City Hall Tape Observations

DATE:__________ COUNCILPERSON:__________________ COUNTER # begin______

PAGE____OF____ # MINUTES ____________ end______

1=senior citizen 2=homeviewer 3=public official 4=other

MUNICIPAL SERVICES:	reqst info	reqst srvc	give info	give opin	actn taken	actn recm	check refer	non resp	argu aggr	other
street/traffic										
sewers/water										
parks/rec										
fire										
police/safety										
transportation										
education										
housing										
redevelopment										
taxes(prop/munic)										
OTHER MUNICIPAL:										
govt & politics										
policy for elderly										
budget & finance										
SYSTEM COMMENTS:										
system (gen'l)										
sr/system power										
refs to other progs										
OTHER:										
________________										
________________										
________________										
________________										

NOTES:

APPENDIX C

Reliability of the Instrument

All forty-six tapes were viewed by one observer. As a check on observer bias and general reliability of the instrument, two other observers were trained in the use of the instrument. The three raters then watched eight (8) half-hour programs together, marking observation sheets independently. The reliability test used was a one-way analysis of variance with repeated measures. A separate alpha coefficient was calculated for each of the interaction categories and each of the content categories, both for the totals and sub-totals, through all eight programs watched.

With regard to the interaction categories (Table 1), 30% of the totals* for these categories have an alpha coefficient of over .90; 70% of them have an alpha coefficient of over .80; and the remaining three categories all have coefficients of .68.** For type of interactions, the problem categories were "action taken" by seniors (-.28) and home viewers (-.25); action recommended by home viewers (-.25); and planned action by seniors (-.25). The lack of reliable agreement on these particular categories could be due both to individual rater bias and insufficient clarification as to exactly what these categories represented. However, the occurrence of comments in these categories is extremely infrequent, leading to zero variance items in each category. The zero variance items are primarily responsible for the negative alpha coefficients.

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*Seniors, home viewers, councilpersons, and others, combined.

**See: J. Nunnally, Psychometric Theory. New York: McGraw Hill Book Company, 1967. According to Nunnally, increasing the reliability coefficients beyond .80 for basic research is unnecessary. He also notes that in the early stages of research on hypothesized constructs, reliabilities of .60 or .50 will suffice.

We obtained alpha coefficients for the number of total interactions in 19 of the 20 content categories ("refs to other programs" was dropped as a category). Table 2 shows the results. Ten (53%) of the content totals had alpha coefficients of over .90; 63% had coefficients over .80; 74% were over .70; and the remaining 3 categories (16%) were between -.04 and .29. Two of this last group were miscellaneous "other" categories and one had a number of zero variance items The problem category was "senior/system power." The alpha coefficients on "senior/system power" for seniors and home viewers were .62 and .75 respectively, but there was disagreement among the three raters as to how often councilpersons made reference to senior/system power (alpha = .21).

APPENDIX C

Table 1

Reliability of the Interaction by Participant Categories in the Observational Instrument

(As presented by Alpha coefficients derived from a one-way analysis of variance with repeated measures.)*

	Seniors	Home Viewers	Council-persons	TOTAL
Requests Information	.94	.96	.99	.93
Requests Service	.93	.81	--	.81
Gives Information	.93	.96	.84	.93
Gives Opinion	.93	.81	.73	.85
Action Taken	-.28	-.25	.85	.80
Action Recommended	.77	-.25	.78	.68
Check/Refer	--	.75	.92	.95
Non-Response	--	--	.88	.88
Argument/Aggressive	.63	.58	--	.68
Other: Planned Action	-.25	--	.73	.68

* A blank means no alpha coefficient was computed due to zero variance items in a category. For some categories that effectively means there was complete agreement among the raters that a particular interaction type did not occur during the eight observed programs.

APPENDIX C
(continued)

Table 2

Reliability of the Content by Participant Categories in the Observational Instrument

(As presented by alpha coefficients derived from a one-way analysis of variance with repeated measures.)*

	CONTENT OF INTERACTION			
MUNICIPAL SERVICES:	Seniors	Home Viewers	Council-persons	TOTAL
Street/Traffic	.76	.98	.91	.92
Sewers/Water	.99	.96	.99	.99
Parks/Recreation	.65	--	.79	.71
Fire	.89	.96	.96	.97
Police/Safety	.99	.97	.98	.996
Transportation	--	--	--	--
Education	--	--	--	--
Housing	.99	.99	.94	.99
Redevelopment	.82	-.11	.75	.77
Taxes (prop/munic)	.95	.94	.89	.98
OTHER MUNICIPAL:				
Government and Politics	.92	.77	.94	.95
Policy for Elderly	.19	.69	.86	.80
Budget and Finance	.81	-.25	.93	.92
SYSTEM COMMENTS:				
System (general)	.98	--	.98	.98
Senior/System Power	.62	.75	.21	.29
OTHER:				
Other 1	.95	--	.91	.96
Other 2	.93	.92	.70	.86
Other 3	-.47	--	-.46	-.04
Other 4	-.06	--	.44	.14

* A blank means no alpha coefficient was computed due to zero variance items in a category. For some categories that effectively means there was complete agreement among the raters that a content topic did not occur during the eight observed programs.

ECONOMIC EVALUATION OF THE OUTPUT OF THE READING INTERACTIVE SYSTEM

by

Judith Fields

Introduction, Summary, and Recommendations

by

Elizabeth Durbin

ECONOMIC EVALUATION OF THE OUTPUT OF THE READING INTERACTIVE SYSTEM

CHAPTER 1

INTRODUCTION

The output of the Reading interactive system is evaluated in this report from three perspectives: the average cost of interactive programming by duration of segment, month of presentation, and social service category; the average cost per participant hour of specific social services; and the uptake of certain outreach programs. Originally, it was hoped that more conclusive evidence on the relative cost effectiveness of the interactive system compared to other service delivery methods could be provided; however, the findings on the effect of the interactive system on the services for which the research was designed were so inconclusive that such a comparison could not be made. This does not mean that the interactive system is not cost effective, but that the complexity of the interactive system and other research factors prevented generation of suitable data to test its effectiveness.

These issues are discussed in this introduction, first, in terms of the difficulty of defining the output of an interactive system and then, with regard to the research implications of the Reading experiment. The following chapters are concerned with each of the three perspectives on the economic evaluation of the interactive system. The last chapter summarizes the major findings of the report.

Output of the Interactive System

The difficulties of defining the output of an interactive system such as the Reading NCC system were discussed at length in the original proposal, Experiment in Urban Telecommunications (see pages 89-114). There are at least three distinct ways in which the output of the system can be defined: (a) interactive system as a service itself, (b) interactive system as channel to deliver other social services, and (c) output of social services provided interactively.

The interactive system as a service itself which provides an opportunity for the elderly to get together interactively and to influence their community is unique and therefore could probably only be compared to other systems through intercommunity comparisons. The effects of the system on the elderly are systematically analyzed in the section of this volume: "Impact of a Neighborhood Communication Center System on the Elderly in Reading, Pennsylvania," and the costs of providing the system described in the section of this report, "Costs of the Reading Interactive System and Alternatives for Replication." Data on the involvement of the elderly as paid staff and volunteers are presented in the latter report. It can certainly be argued that one important output of the interactive system is the opportunity it provides for interesting and rewarding activity for the participants, and further, the effects which that activity had on improving the situation of the elderly by service deliverers, the community, and the elderly themselves.

Since other sections of this report deal extensively with measuring these outputs, this analysis concentrates on the evaluation of the interactive system as a channel for service delivery and the outputs of those services. Table 1.1 provides a summary of the quantity of interactive programming and attendance at NCCs by social service delivered. The social services are divided into five main categories:

1. Information and Referral - Outreach
2. Information and Referral - Interaction with Service Supplier
3. Direct Delivery - Form Filling
4. Direct Delivery - Education
5. Direct Delivery - Recreation.

The individual topics under the five main categories are either specific services chosen for their research potential, e.g., food stamps and Medicare forms, or are reasonable categories for grouping the services delivered through a wide variety of programming formats, for instance, local and state government, health education, and recreation-social. These categories and the differences in the cost of providing interactive programming under each heading are discussed in much greater detail in the following chapters. It is interesting to note that of a total of 593 program segments, recreation-social was by far the largest, comprising roughly 40 percent of programming time. Education was next with 30 percent, followed by outreach with 17 percent, interaction with service supplier 12 percent, and form filling only 2 percent. Of the specifically identified services, interaction with local and state government, consumer education, and health education head the list with more than 35 hours of interactive programming during

Table 1.1

Quantity of Interactive Programming and Attendance
Over NCC System by Major Service Category
January - December 1976

SERVICE CATEGORY	QUANTITY OF PROGRAMMING			ATTENDANCE	
	Total Program Segments	Total Spots	Total Hours	Total Attendance*	Average Attendance Per Program
I. INFORMATION & REFERRAL					
A. Outreach					
1. Food Stamps	5	32	3.0	116	23.2
2. Other Public Asst.	10	11	4.8	217	21.7
3. Social Security Banking Option	2	36	2.1	38	19.0
4. BCSCC Activities	11	37	3.5	169	15.4
5. Housing, Transportation, and Legal	6	55	4.5	134	22.3
6. Other Services	104	52	44.7	3,086	29.7
B. Interaction with Service Supplier					
1. Social Security	23	32	6.0	373	16.2
2. Local/State Gov't.	67	65	36.7	2,698	40.3
II. DIRECT DELIVERY					
A. Form Filling					
1. Earned Income Forms	1	2	1.0	27	27.0
2. Medicare Forms	3	7	2.4	91	30.3
3. Rent Rebate Forms	3	9	3.0	68	22.7
B. Education					
1. Consumer Education	45	9	36.7	812	18.0
2. Health Education	41	118	42.4	1,056	25.8
3. Other Education	53	31	33.3	1,279	24.1
C. Recreation					
1. Recreation-Social	219	170	145.8	8,771	40.1
TOTAL	593	666	369.9	18,935	31.9

* This is the sum of attendance figures and therefore does not represent the numbers of different persons who attended since many individuals attended many different program segments.

the year out of a total of 370 hours. Average attendance for the programming segments at the centers was 32. By far the highest average attendance was for interaction with local and state government and recreation-social.

Various particular services were identified for detailed research on their outputs and measures for cost effectiveness of delivery (see Test and Evaluation of Public Service Uses of Cable Television: Reading, Pennsylvania, pp. 27-89). These services were chosen for three basic reasons. First, the services were considered to be important for the elderly; second, a significant portion of the eligible were not receiving the services; and third, they were amenable to interactive delivery. The design called for comparison in service uptake between experimental groups with access to the interactive programming and control groups without access. The results of this research are discussed in Chapter Four, but in general it is fair to say that there was no clear evidence that the interactive programming improved uptake of services. There are a number of reasons why this research did not provide a fair test of the effectiveness of interactive service delivery, the most important of which are discussed in the next section.

The lack of proper service output measures meant that the original plans to provide measures of cost effectiveness could not be carried out. Therefore, the economic evaluation presented in this section uses the definition of output which considers the interactive system as a channel for service delivery and measures the use of the system in terms of: a) program segments and b) participants. Chapters Two and Three present and analyze the average costs of these outputs by the Reading system. Chapter Two contains estimates of the average cost of interactive programs for the whole system and by different service category. Evidence is also presented of the importance of the learning curve in reducing the costs of interactive programming and precise estimates of its effect. Chapter Three links the costs by service category to estimates of the population which viewed the programs either as participants at the NCCs or as home viewers. Estimates of average cost per participant hour are made and the effects of expanding the system on these costs are discussed. Comparisons are made with the costs of alternate means to deliver these services wherever feasible. In Chapter Four, the experimental findings on the uptake of three specific services are presented. Finally, the major results are summarized and recommendations for the uses of the system and further research are made.

Research Issues in the Reading Interactive System

In addition to the output measurement problems discussed above, there were other issues which made the economic evaluation particularly difficult in Reading. The critical problem for all the research on outcomes of the interactive system was the extremely short duration of the period of impact. One year was simply not sufficient to test the full impact of introducing an innovative communications system either in theory or in practice. This is especially true of services which, for one reason or another, may require a change in attitudes to increase uptake. For instance, it was known that many elderly were eligible for food stamps but were not applying for them. It seems probable that changes in attitude by service receivers, deliverers, or both are a prerequisite to increased service uptake. Although applications at the agency did not increase significantly during the year, it was found that more elderly with access to the system were considering applying. It would take more programming over a longer period and experimentation with different programming ideas, perhaps including provision of food stamps at NCCs, for changes in attitude to be translated into action.

The short period of time was further complicated by the range of services which the system attempted. Since there were no guidelines about what kinds of programming and services would be most feasible and popular, nor, indeed, whether the system could become self-generating, an enormous variety of programming ideas were tried. This meant that it was difficult to focus on any one service unless it was also found to be popular. Thus, interaction with local and state government proved popular and regular "Inside City Hall" programs were scheduled. As already noted the recreation-social programming also drew large groups of participants to such regulars as "Singalong." Thus, as the programming developed, more time was taken with non service-specific programming. The research design called for cost effectiveness studies of outreach on food stamps and the Social Security Direct Banking Option and of form filling on earned income, Medicare and rent rebate forms; Table 1.1 shows that only 14 segments and 86 spots were presented on all these topics together for a total of 11.5 hours. In short, the amount of programming devoted to the specific social services to be evaluated was not sufficient to constitute a significant test of the power of interactive services, quite apart from questions of how well the services were delivered.

There were two reasons why so little programming was done on the services to be evaluated. First, the experiment was committed to the idea of involving the participants in both the presentation of programming and the planning of what should be programmed. It is clear from Table 1.1 that, with the exception of Medicare form filling, which had an average attendance close to that for the whole system, most of the programming services for public assistance and Social Security services had below average attendance. Furthermore, the Regional Director of Social Security, who held a regular program, commented in a research interview that he seemed to see the same few faces at the centers each week. In short, programming on the social services which had been chosen for the needs which the service deliverers felt were unmet, was not popular with those interested in participating in programming at the centers. Thus, there was a conflict between providing programming which interested active participants and programming which met important service goals as perceived by social-service deliverers.

Secondly, there was a conflict in the early stages of programming between the needs of implementation and the aims of the research. Due to fears of contamination of the pretest survey, the implementation team had been strongly discouraged from active recruitment of elderly volunteers. Thus, when regular programming began there were very few elderly participants at the centers. In addition, the program planning had been done by the NCC staff with the agency personnel. A major priority at the beginning was to produce programming which brought participants into the centers. Thus, there was understandable pressure to produce more social and recreational programming.

For these reasons, it does not seem as though interactive service delivery has been given a fair trial in the Reading experiment. Now that the system has settled down, it would be worthwhile to conduct experiments with specific services.

CHAPTER 2

AVERAGE COSTS OF INTERACTIVE PROGRAMMING IN READING

Introduction

The average costs of interactive program segments in Reading are investigated in this chapter. These costs are estimated from data collected on the time inputs of the NCC staff, elderly volunteers, and agency personnel in preparing and presenting segments. The time inputs are given a dollar value based on the actual or potential wages of each participating group. Therefore, these costs represent the manpower effort directly involved in programming; they do not include estimates of the overhead costs of running, maintaining, and planning the system. An estimate of these overhead costs is made at the end of this chapter using data presented in the section "Costs of the Reading Interactive System and Alternatives for Replication."

The direct manpower inputs for preparing and presenting interactive programs are estimated and analyzed in detail in the first section of this chapter. Particular attention is paid to showing the shifts in the relative contributions of NCC staff, elderly volunteers, and agency personnel during the year. It was found that the elderly took on much greater responsibility for programming as the year progressed. In the second section, the average costs by social service category are estimated and found to vary considerably. The categories follow those already described in Chapter One. In the last section, the average costs are analyzed to determine the precise effect on average program costs of the three crucial factors: (a) duration of segment, (b) month of presentation, and (c) social service category. A regression analysis is performed which enables the impact of each of these three factors on costs to be measured separately. The reduction in costs attributable to the month of presentation is evidence of the existence of a learning curve effect, and it was found to be significant. In fact, it is estimated that the average cost of producing a half-hour program fell from $69 to $41 over the experimental year.

Direct Manpower Costs of Interactive Programming

There are two stages in the production of interactive programming which are analyzed separately: (1) the preparation of a segment and (2) the live presentation of the segment. The contributions of NCC staff, paid elderly staff, elderly volunteers, and agency personnel are described for each stage. Changes by quarter are then analyzed to show the extent to which the elderly took over the system. Finally, the average direct manpower costs of preparation and presentation are estimated using actual salaries of all paid NCC staff and agency personnel and the potential earnings of the elderly volunteers.

Manpower in the Preparation of Segments

The preparation of program segments involved planning the segment, contacting the agencies or persons who were to appear as presenters, gathering (sometimes making) props and other special equipment which might be needed, and planning or rehearsing the technical procedures which were to be used. This preparation process was carried out over a period of days, and sometimes weeks, before the date on which the segment was finally presented. Logs of time inputs were kept by all the individuals who worked to prepare a given segment. Since work on one segment rarely coincided with work on another, these inputs were relatively simple to track.

Table 2.1 presents the findings for each of the manpower categories on the number of programs to which preparation was contributed, the total number of hours in preparation, and average hours per program for all programs. The average number of manhours per program was 4.6, which is the total hours divided by the total number of programs. Therefore, also included in Table 2.1 are data on the number of manhours and the percent of manhours contributed by the NCC staff, volunteers, and agency personnel to the average program.

It is interesting to note that of the total of 593 programs, no one group worked to prepare more than about one-third. NCC coordinators worked on more segments than anyone else (226), followed by two categories of elderly persons: the senior aides (203), and the elderly volunteers (159). In short, no one person or position was a necessary input into the preparation of all or even of most segments; a variety of combinations or types of labor could be substituted for one another in this part of the production process. The table also shows that the three main categories, NCC staff, elderly (taking senior aides and volunteers together), and agency personnel, each contributed roughly one-third to the average program.

Table 2.1

Average Hours Spent on Preparation of Segments Over Reading Interactive System by Manpower Category

MANPOWER CATEGORY	FOR ALL PROGRAMS			FOR AVERAGE PROGRAM	
	Total Programs Prepared	Total Hours in Program Preparation	Average Hours Per Program	Manhours	Percent of Manhours
I. NCC Staff					
Production Manager	111	188.7	1.7	.31	7%
Production Researcher	71	156.2	2.2	.26	6%
Secretary	16	3.2	0.2	.05	1%
NCC Coordinators	226	361.6	1.6	.61	13%
Technical Aides	74	155.4	2.1	.26	6%
Senior Aides	203	426.3	2.1	.71	16%
II. Volunteers					
Elderly Volunteers	159	381.6	2.4	.65	14%
Other	92	358.8	3.9	-	-
III. Agency Personnel					
BCSCC Staff	20	34.0	1.7	1.71	37%
Social Security	17	15.3	0.9		
Public Assistance	8	20.0	2.5		
Other Public Agencies	119	285.6	2.4		
Other Private Agencies	68	292.4	4.3		
TOTAL	593	2,679.1	4.6	4.56	100%

Manpower in the Presentation of Segments

The presentation of segments refers to activity which took place in the NCCs and from any other site connected with the system for that segment on the day it was presented. It included setting up equipment, lights, chairs, etc. before the start of the segment, operating cameras and sound equipment during the segment, appearing on camera as presenters of the segment, and assisting, for example, in passing out materials and seating people during the course of the presentation, as well as dismantling the studio afterwards.

Tracking the inputs to these activities was more difficult than it was for preparation. Segments were frequently presented jointly in "sessions" with other segments. Furthermore, during the year, more sessions included more than one segment and the average length of an individual segment declined. 'Session' was the term given to one uninterrupted period of origination. Generally, there were afternoon sessions as well. Sessions lasted from 1 1/2 to 2 hours and contained anywhere from one to five separate segments with spots in between. Set up of lights, cameras, and sound equipment was usually carried out for the session as a whole. Also, one crew tended to run the audio and video equipment for an entire session. These activities (setting up, running equipment, and tearing down) were classed as 'support.' The manpower inputs for support were tracked for each session. The total cost for each segment includes a share of these joint presentation costs. The formula for estimating a segment's share of joint costs is given in Appendix A. To these were added the time inputs of persons working to present a given specific segment, the presenters, and their assistants. These inputs were more easily identified for each segment.

Table 2.2 contains the same information for presentation as given for preparation in Table 2.1. The manpower categories are not as disaggregated because of the difficulty of tracking joint support inputs in greater detail. The table shows that NCC system staff worked as presenters or as assistants on 341 segments, almost 60 percent of the total elderly volunteers worked on 248, and agency personnel presented on 208. The average amount of time spent on program presentation was 2.06 hours, or less than half the time spent on preparation. Altogether, roughly 6 1/2 manhours went into producing an average interactive segment (4.6 + 2.1 = 6.7).

This is very low in comparison to one-way television production. The difference is due to the interactive nature of the Reading system. Unlike programs produced for one-way broadcast TV, which are heavily rehearsed and controlled presentations, interactive segments are designed to be highly informal and spontaneous. Preparation involves planning and gathering the necessary ingredients for the interactive presentation, but it does not attempt to control what is to occur during presentation by detailed script or other means. For this reason, presentation was an important part of the process of producing a segment, in which all the major actors participated; that is, staff, elderly volunteers, and service deliverers.

The contributions of the elderly to presentation are underestimated in these calculations since the paid senior aides are included with NCC staff. At first there were no paid senior citizens,

Table 2.2

Average Hours Spent in Presentation of Segments Over Reading Interactive System by Manpower Category

MANPOWER CATEGORY	FOR ALL PROGRAMS			FOR AVERAGE PROGRAM	
	Total Programs Presented	Total Hours in Program Preparation	Average Hours Per Program	Manhours	Percent of Manhours
I. NCC Staff (including Senior Aides)	341	528.6	1.55	.89	43.2%
Estimated Senior Aides*				(.30	14.4%)
II. Volunteers					
Elderly	248	297.6	1.20	.50	24.3%
Other	24	41.5	1.73	.06	2.9%
III. Agency Personnel	208	364.0	1.75	.61	29.6%
TOTAL	593	1,231.7	2.06	2.06	100.0%

* Assuming senior aides contributed one-third to presentation manhours as they did to preparation (See Table 2.1).

but by the end of the experiment, there were nine seniors who were paid for their services. However, it is clear that the elderly contributed more to presentation than they did to preparation. Elderly volunteers contributed 24 percent of the manhours in the average program, while they gave only 14 percent to preparation. The percentage of agency personnel manhours in the average program was 38 percent for preparation and was 30 percent for presentation despite the fact that some service officials had regular programs.

Changes in Manpower During the Experiment

The same personnel were involved in the production of segments throughout the one-year experimental period. However, both the total labor requirement and the relative contributions by each category of person changed over time. Table 2.3 shows the total manhours of labor required to produce an average segment during each quarter of the experimental year. It also lists the proportion of this which each manpower category contributed. The total number of manhours required to prepare and present an average segment fell dramatically from nine hours to little more than five hours over the course of the year. This decline suggests the presence of a learning curve. However, this result is due to two tendencies. First, production became more efficient as those involved gained experience, but at the same time, the average duration of a segment, one of the major factors determining the cost of producing a segment, also fell sharply. In the third section of this chapter, the independent strengths of these two effects will be analyzed through multiple regression.

Table 2.3

Manhours For Preparation and Presentation of Average Program and Percent of Manhours by Manpower Category Per Quarter in Reading Interactive System

	QUARTERS IN 1976			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
I. PREPARATION				
A. Manhours to Prepare Average Segment				
Total Manhours	6.80	5.61	4.51	3.37
B. Percent of Manhours Given to Preparation				
NCC System Staff	30.6%	36.9%	30.4%	32.6%
Senior Aides	5.9%	15.5%	24.2%	15.0%
Elderly Volunteers	13.5%	8.4%	16%	18.7%
Agency Personnel	50%	39.2%	29.5%	33.5%
TOTAL	100.0%	100.0%	100.0%	100.0%
II. PRESENTATION				
A. Manhours to Present Average Segment				
Total Manhours	2.20	2.40	2.19	1.76
B. Percent of Manhours Given to Presentation				
NCC Staff Including Senior Aides	22%	35%	48%	54%
Elderly Volunteers	10%	32%	26%	24%
Other Volunteers	6%	7%	2%	0%
Agency Personnel	62%	26%	24%	22%
TOTAL	100.0%	100.0%	100.0%	100.0%
III. TOTAL MANHOURS OF PREPARATION AND PRESENTATION				
Total Manhours per Average Segment	9.00	8.01	6.70	5.13

As the system was producing more segments in each quarter than it had in the previous one, the average amount of presentation time per segment was bound to decline. Presenters' time input for a given segment is directly related to the duration of that segment. The average amount of preparation time per segment is not determined by duration in the same way. Assuming that quality does not decline, a decline in manhours for preparation is a direct measure of improved efficiency.[1] The total number of manhours of labor required to prepare an average segment fell from 6.80 hours in the first quarter of the year, to 3.37 hours in the final quarter, and the downward trend is consistent over all four quarters. This improved efficiency in producing segments occurs as all three classes of labor (system staff, elderly volunteers, and agency personnel) became more experienced with the process of preparing segments. Furthermore, formats became more settled and some programs simply repeated their format so less planning was required beforehand. By the fourth quarter, only 3.37 manhours were required for preparation. Although data on inputs have not been tracked since, it seems likely that this is a reasonable estimate of what it takes now, and that it is not likely to decline further.

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[1] There is evidence that the quality of interaction improved during the year; home viewers were more involved, the split screen was used more often and, in general, participants learned to communicate more effectively. For further details, see sections of this volume: "Interactive Television: A Frame Analysis" and "Implementation of the Reading Interactive Cable Television System."

Changes in the percent of manpower hours for the average segment by major manpower category show a decrease by agency personnel and an increase by the elderly. The share of input by agency personnel into both preparation and presentation fell sharply over the course of the year, from 50 percent to 33 percent of the total input for segment preparation and from 62 percent to 22 percent of the total for segment presentation. This can be seen as an increase in the efficiency of the NCC system. The time of agency personnel is scarce and valuable. A deliberate effort was made by the NCC system to have both system staff and elderly volunteers become knowledgeable and experienced about many of the services which the system was being used to deliver and to substitute for agency personnel wherever possible. This substitution process occurred, of course, only in those areas of programming (such as outreach, education, and recreation-social interaction) where agency personnel were not required.

The total contribution to program preparation by the elderly, the elderly volunteers, and the senior aides increased substantially during the year. The combined share of these two groups rose from 19.4 percent in the first quarter to 23.9 percent in the second and to 40.2 percent in the third, but then declined slightly to 33.7 percent in the fourth quarter. This decline in the last quarter was probably the result of inclement weather and an increased incidence of illness among senior aides. The same trend can be seen in the contribution of the elderly to segment presentation, even though the input of senior aides is included with other NCC system staff. The elderly volunteers increased their input to presentation from 10 percent to 24 percent. Furthermore, it is not unreasonable to assume that a major part of the increase from 22 percent to 54 percent by the NCC staff can be ascribed to the senior aides, nine of whom joined the paid staff during the year. Furthermore, senior aides increasingly took over the role of presenters while other staff members did not. Adjusting for senior aides by assuming they contributed the same proportion to NCC staff for presentation as for preparation, the total contribution of the elderly rises to 38.7 percent for presentation.[2]

Manpower Costs of Average Program Segment

Up to this point, the inputs to the production of a segment have been discussed in terms of manhours. In this section, these inputs are priced to yield estimates of the manpower costs. The cost information in the rest of this section has all been calculated in the same way using the same salary bases. Table 2.4 presents the hourly salary base information used for program preparation, program presentation, and the joint costs of support staff during a session. The manpower cost for a program is the sum of all the manhour inputs for preparation, presentation, and shared support multiplied by these hourly wages. It should also be noted that non-labor costs which could be directly tracked for program preparation only were included in the manpower cost estimates. However, these non-labor

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[2] Senior aides formed one-third of the manpower input of the NCC staff to preparation (see Table 1.2). One-third of 43.2 percent, the manpower input of all NCC staff to presentation, is 14.4 percent. Thus, the elderly contribution to presentation is 24.3 percent from volunteers and 14.2 percent from senior aides, for a total of 38.7 percent.

Table 2.4

Salary Bases Used For Estimating Direct Manpower Costs in Reading Interactive System

MANPOWER POSITION	HOURLY SALARY BASE For Program Preparation	 For Program Presentation	 For Joint Support
	$	$	$
I. NCC Staff			
System Coordinator	-	-	7.50
Production Manager	4.57	4.35	4.57
Production Researcher	4.41		4.41
Secretary	3.68		-
NCC Coordinators	4.28		4.28
Technical Aides	3.57		3.57
Senior Aides	2.50		2.50
II. Volunteers			
Elderly	2.50	2.50	2.50
Other	-	2.50	-
III. Agency Personnel			
Average	5.49	5.49	-
	+ Direct Non-Labor Costs, if any.		

costs which included such items as travel costs, were very small and frequently zero. Therefore, the direct costs of producing segments are the manpower costs and are called this throughout, although the estimates do in fact include these minor non-labor costs of preparation.

These manpower cost estimates do not represent staffing costs for the Reading experiment since they include costs of agency personnel and volunteers who were not paid. The actual staffing costs are discussed in detail in the section "Costs of the Reading Interactive System and Alternatives for Replication." These estimates do reflect the true economic cost of the resources used and are thus the appropriate measure to use for comparison with the costs of alternative uses of these resources in tests of cost effectiveness. The salaries of agency personnel were paid by their agencies and the figure used here is an average of the salaries paid to agency personnel who contributed to program production over the interactive system. They are true estimates of the alternative costs for the use of the time of these service deliverers.

It is not as clear what the alternative cost for the volunteer time donated by the elderly should be. It can be said that it is zero because the volunteers are retired and do not have work alternatives in the sense that other participants do; they also volunteer for many other alternative services for the elderly. Furthermore, it could be argued that the elderly themselves are benefitting from this use of their time; indeed, they would not volunteer if they were not. In other words, their contribution represents the value to themselves of participating. However, these arguments are not appropriate for cost effective measures when an estimate of what it would cost to provide the same service is necessary. For this purpose, there is a value to the work contributed since someone would have to be paid to do it, if the volunteers were not forthcoming. The appropriate wage should therefore be the salary which would have to be paid to hire people to perform the same tasks. However, it is not at all clear what that salary would be since there was no attempt to figure out the appropriate job description and, therefore, the relevant wage. In this study, the wage paid to the elderly who were hired as senior aides has been used, that is $2.50 per hour, which is also approximately the minimum wage level. This is probably an underestimate of the true alternative costs for two reasons. First, the $2.50 base was decided in order to keep earnings of the elderly below the limit for earnings before social security pensions are reduced. It is an institutional limitation which does not apply to other groups. Secondly, some of the elderly who were hired in Reading felt that they should be paid what the job was worth, and are now paid at a rate similar to that of technical aides.

Using these salaries and the manhour estimates from Tables 2.1, 2.2, and 2.3, average costs per segment and per manhour for preparation and presentation were calculated. The results are presented in Table 2.5. This shows the decline in average costs due to two different effects: (a) the decrease in manhours per segment and, (b) the substitution of elderly for NCC staff and agency personnel.

Table 2.5

Average Costs Per Segment and Per Manhour For Preparation and Presentation of Interactive Programming in 1975

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Average
I. PREPARATION COSTS					
Number of Manhours per Segment	6.80	5.61	4.51	3.37	4.56
Average Cost per Segment	$31.28	$24.40	$17.86	$14.05	$19.09
Average Cost per Manhour	$ 4.60	$ 4.35	$ 3.96	$ 4.17	$ 4.19
II. PRESENTATION COSTS					
Number of Manhours per Segment	2.20	2.40	2.19	1.76	2.06
Average Cost per Segment	$10.30	$ 8.59	$ 7.38	$ 6.44	$ 8.17
Average Cost per Manhour	$ 4.68	$ 3.58	$ 3.37	$ 3.66	$ 3.97
III. PREPARATION AND PRESENTATION COSTS					
Number of Manhours per Segment	9.00	8.01	6.70	5.13	6.62
Average Cost per Segment	$41.58	$32.99	$25.24	$20.49	$27.26
Average Cost per Manhour	$ 9.28	$ 7.93	$ 7.33	$ 7.83	$ 8.16

Preparation costs per hour were cut by more than half and presentation costs by forty percent. The addition of these two costs shows a decline from about $40 to $20 per segment. These are less than the total costs per segment since they do not include the joint costs per session. Average costs per manhour are included to show the effect on costs of the switch from agency personnel and NCC staff to elderly. The last quarter showed a slight increase because of the absence of some senior aides through sickness; otherwise there was a 20% decline through the third quarter.

Average Manpower Costs Per Hour by Social Service

In the last section average manpower costs per program segment were calculated for the Reading system. These averages, however, conceal wide systematic variations in these costs which this section will explore further. The three crucial factors affecting costs are:

1. Duration of program segment
2. Month of operation
3. Social service category.

Quarterly information on manpower costs of the average program segment showed a substantial decline over the year, but did not hold constant the length of the segment or the social service category. Estimates of average manpower costs per hour are presented here for the social service categories already discussed. Next, the results of a regression equation which controlled for each of the three factors and enabled the net effect of each on average program costs to be estimated precisely are discussed.

Table 2.6 contains estimates of average manpower costs per segment by social service categories and the percentage distribution of manpower costs attributable to the three main groups, NCC staff (including senior aides), agency personnel and elderly volunteers. Table 2.7 compares these manpower costs per segment with average manpower costs per hour for the different services. In this table, since the duration of segments is held constant, the cost differences between the services is clearer, although the effect of the decline in costs over the year is not controlled. Each major service area will be discussed in turn to bring out some of the explanation for the differences in these costs.

Information and Referral: A. Outreach

Of the five topic areas covered under outreach, programming for three (housing, transportation, and legal; food stamps; other public assistance) was more expensive for both average segment costs and average hourly costs than the other two topics. They cost more to produce because they used more of all three manpower factors, agency personnel, elderly and NCC staff, than the other two topics. Also, compared with other service programs, these three used relatively more staff and agency time and less elderly time. The cost of NCC staff and agency personnel is about twice that for the elderly. BCSCC outreach programming did not use more elderly input than the expensive topics, but it did use considerably less input from all three factors.

Table 2.6

Average Manpower Costs Per Segment and Proportions Attributable to NCC Staff, Agency Personnel, and Elderly Volunteers by Major Service Category in Reading Interactive System

SERVICE CATEGORY	PERCENT OF AVERAGE MANPOWER COSTS ATTRIBUTABLE TO:			AVERAGE MANPOWER COSTS PER SEGMENT
	NCC Staff	Agency Personnel	Elderly Volunteers	
I. INFORMATION AND REFERRAL	%	%	%	$
A. Outreach				
1. Housing, Transportation, and Legal	66	27	7	$108.76
2. Food Stamps	63	20	17	91.06
3. Other Public Assistance	50	40	10	76.70
4. Other Services	50	21	29	43.17
5. BCSCC Activities	67	16	17	29.32
B. Interaction with Service Suppliers				
1. Local/State Gov't.	66	15	19	60.51
2. Social Security	70	21	9	32.41
II. DIRECT DELIVERY				
A. Form Filling	68	19	13	94.94
B. Education				
1. Health Education	44	46	10	103.80
2. Other Education	61	23	16	55.76
3. Consumer Education	53	15	32	38.91
C. Recreation				
Recreation-Social	72	3	25	58.70

Table 2.7

Average Manpower Costs Per Segment and Per Hour by Major Service Category in Reading Interactive System

SERVICE CATEGORY	MANPOWER COSTS PER SEGMENT		MANPOWER COSTS PER HOUR	
	Total Segments	Average Cost Per Segment	Total Hours	Average Cost Per Hour
I. INFORMATION AND REFERRAL				
A. Outreach				
1. Housing, Transportation, and Legal	6	$108.76	4.5	$241.69
2. Food Stamps	5	91.06	3.0	252.94
3. Other Public Assistance	10	76.70	4.8	273.92
4. Other Services	104	43.17	44.7	172.68
5. Direct Banking Option	2	-	2.1	171.43
6. BCSCC Activities	11	29.12	3.5	154.32
B. Interaction with Service Suppliers				
1. Local/State Gov't.	67	60.51	36.7	183.36
2. Social Security	23	32.41	6.0	202.56
II. DIRECT DELIVERY				
A. Form Filling				
1. Earned Income	1	-	1.0	153.23
2. Medicare	3	94.94	2.4	159.45
3. Rent Rebate	3	-	3.0	187.93
B. Education				
1. Health Education	41	103.80	42.4	167.42
2. Other Education	53	55.76	33.3	146.74
3. Consumer Education	45	38.91	36.7	185.29
C. Recreation				
Recreation-Social	219	58.70	145.8	146.75

One important reason for these cost differences is the difference between the average duration of the segments presented on each. Table 2.7 shows that even though the same three topics are still the most expensive, there is less variation. In fact, the hourly costs of the three are quite similar and about $80 more than the others. Another reason for the higher costs was that a great deal of effort was being put into these topics because they were being used to track the effectiveness of the NCC programming for research purposes. All three topics usually involved the use of experts from local agencies as preparers and presenters of programming, and agency personnel were consulted for all preparations. Since important local agencies were using the system for the outreach programs, relatively more time and energy by system staff was also devoted to program preparation. Furthermore, programs on these topics tended to use the same agency presenters once or twice only, and therefore they did not gain experience with the NCC system. For this reason, the time required for preparation (both by agency and system staff) tended to be longer. The other service and BCSCC categories, by contrast, used far more elderly presenters and fewer agency presenters; only 40% of these programs had input from agency personnel. These programs tended to be prepared and presented by elderly volunteers, who were themselves consumers of and experts on the service.

There is an added factor which may explain why the outreach programming falls into two distinct cost groups. All services on which outreach was relatively more expensive were fairly complex programs with intricate eligibility requirements and benefits. The services on which the "cheaper" outreach programming was done, such as the activities and services of BCSCC, entailed much less complexity. When a topic was complex, considerable work was required by staff, by the elderly and by the agency to arrive at a means of communicating this information in an interesting and comprehensible way.

The conclusion to be drawn is that the cost of interactive outreach programming is strongly affected by the nature of the service on which outreach is being done. More complex services require more time, intensive program production and longer presentation times and, thus, cost more. Finally, since fewer interactive programs were done on each of the more complex services than on the others, production costs did not have an opportunity to decline as experience was gained.

Information and Referral: B. Interaction with Service Supplier

This category of social service contained two topics: interaction with social security and interaction with local and state government. Both had lower average segment costs and average hourly costs than the expensive outreach topics, although they were more expensive than other outreach topics. Both topics also had relatively large inputs from NCC staff compared to the outreach programming and smaller inputs from the elderly and the agencies. The mobile unit was always used for these interactive formats which needed additional NCC support staff in their presentation. Their low agency input occurs because these topics, unlike outreach programming, used the same agency presenters again and again. The agency staff involved gained considerable experience with the NCC system and became quite efficient as preparers and presenters of interactive programming.

Direct Delivery: A. Form Filling

This category of social service contained three topics: earned income forms, Medicare forms, and rent rebate forms. Since only a few programs were actually done on each of these topics, they were grouped together into one category for estimating average segment costs. Although comparatively expensive in terms of average segment costs, the hourly costs for form filling were at the low end of the scale. It is clear that the major reason for this is the longer average hours of form filling segments, for there are many other reasons to expect higher costs. First, very few programs were done on form filling, so there was less opportunity to become experienced and to increase the efficiency with which programs were prepared and presented. In addition, this programming (like outreach on the more complex services), did involve substantial preparation time by NCC and agency staff. It required more presenters and assistants to help elderly participants fill out their forms. A number of technical problems arose in connection with this programming; for example, finding a way to enable elderly participants to adequately see a sample of the particular form which was being discussed. Each of these problems required large inputs of time to solve.

Direct Delivery: B. Education

Of the three topics under this category, health education has very high average manpower costs, while consumer education and other education are low. However, consumer education has the highest hourly costs, while other education has the lowest of all service topics. So, in general, these topics are at the lower end of the hourly scale.

Health education programming segments were long (the average was one hour), and they tended to use more experts and agency staff than either of the other two education topics. Education thus contains two distinct groups, as does the outreach category, and for similar reasons. The distinction lies in the greater complexity of the topic which requires greater expert knowledge for preparation and presentation. Health education programming used the highest relative input of agency time of any category (46% of the total cost), while other education and consumer education used more elderly and less NCC staff.

Direct Delivery: C. Recreation-Social Interaction

Recreation-social interaction programming had low average segment costs and average hourly costs. Programming under this topic used less agency input than any other topic (3 percent), and although a high percent of its cost went for staff input (72 percent), the actual amount of staff time it used was low relative to most other topics. The very low agency time input arises because recreation programming involved the direct delivery of a service by the NCC system and did not, as form filling and health education, require the use of experts or agency staff in its preparation or presentation.

Estimated Effects of Duration, Social Service, and the Learning Curve on Average Program Costs

In this section, the precise effects of duration, of the different social services and topics and of the learning curve, are estimated by means of multiple regression analysis. The manpower cost of producing a segment was regressed on duration of segment, month of operation in which the segment was produced, and dummy variables representing the topic of the segments. The actual estimating equation and regression results are presented in Appendix A.

The results provided consistent and highly significant effects for duration and month of operation. The equation with these two variables alone explained 41 percent of the variance ($R^2 = .41$). The coefficients obtained indicate the following findings:

1. The manpower cost of producing a segment increases 70 cents for each additional minute.

2a. The average manpower cost of producing segments fell by $2.17 each month over the 12 month period of the experiment.

b. The average manpower cost of producing a one-half hour segment fell from $69 to $41 over the 12 months holding social service constant.

From these results, the evidence for a strong learning curve effect is conclusive. The major ways in which this increase in efficiency were manifested have been discussed throughout this chapter and can be summarized as follows:

1. The elderly were trained during the period and proved able to take over for both agency personnel and NCC staff.
2. Both the elderly paid as staff members and elderly volunteers took over an increasing share of the programming. The hourly cost of their labor was half that of NCC staff and agency personnel.

3. The elderly took an increasing share of both preparation and presentation, but took over more in presentation.

4. All groups, NCC staff, agency personnel, and the elderly gained experience during the year and therefore the time inputs for all manpower fell significantly.

5. The time inputs for all three groups fell in both preparation and presentation, but fell more in preparation.

6. The services in which it was possible to substitute elderly for the more expensive agency personnel and NCC staff were the less complex. The more complex in terms of rules and regulations, the less possibility for substitution.

In addition, the results also indicate significant differences between the different social service topics. Twelve dummy variables were included to represent these different topics. These topics are the same as those discussed throughout the chapter with two exceptions when the amount of programming did not warrant separate variables. These were:

1. The direct banking option outreach topic, which was added to other services.

2. The three form filling topics which were added together as one variable called form filling.

The explanatory power of the regression model was not greatly increased by the addition of twelve dummy variables for topic of the segment. Adding all the social service topic variables raised the R^2 to only .47 from .41. About half of these topic variables had significant regression coefficients in each equation, but several were not significant in any equation. The regression model in which recreation-social interaction was the excluded dummy variable explained 48% of the variation in the manpower cost of producing a segment. The estimating equation for a segment on recreation-social interaction is as follows:

$$C_R = \$47.90 + \$\ .70\ (D) - \$2.17\ (M)$$

where:

C_R = estimated manpower cost of producing a segment on recreation-social interaction

D = duration of segment in minutes

M = month of operation in which segment is produced.

From this equation, it can be estimated that a recreation-social interaction program of one-half hour (30 minutes) produced in the average month (7.8 or the later part of July) [illegible]uld cost $51 to produce.

The costs of each social service topic can be estimated in a similar way. The results are presented in Table 2.8 where the topics are listed in descending order of cost. There are two quite distinct groups: those with average manpower costs ranging from $75 to $90 per half hour and those with average costs around $50 per half hour. The more expensive group are those which involve the more complex services: outreach for food stamps, public assistance and housing, transportation and legal topics, form filling and health education. It is interesting to note that the two interactive topics--interaction with social security and with local and state government--are in the less expensive group despite the input from senior agency personnel. The most popular program topics--interaction with local and state government and recreation-social interaction--are both in the less expensive range. The least expensive service

Table 2.8

Average Manpower Cost of Producing One-Half Hour of Interactive Programming on Various Topics as Estimated by Multiple Regression Model*

Social Service Topic	Average Cost Per 1/2 Hour Program
	$
Outreach on Housing, Transportation, Legal Services	92
Outreach on Food Stamps	86
Outreach on Other Public Assistance Services	80
Form Filling	78
Health Education	77
Other Education	52
Consumer Education	51
Interaction with Social Security	51
Interaction with Local and State Government	51
Recreation-Social Interaction	51
Outreach on Other Services	49
Outreach on BCSCC	43

* It is assumed that the program was produced in month 7.8, the average value for this variable.

of all was the outreach for the Berks County Senior Citizens Council activities.

From these results it can be concluded that most 30-minute programs in the average month cost a minimum of $50; that those delivering expensive services cost at least $25 more; and that the very expensive outreach programs cost as much as $40 more. Both form filling and health education, which did not appear so high in the average hourly costs, are among the expensive services as would be predicted by the high agency input and their degree of complexity.

In general, this finding illustrates the advantages of the regression technique which enables the independent effect of critical variables to be measured separately. However, it should also be noted that in reality the variables may not be strictly independent. It was certainly clear that there was a relationship between duration of segment and the month of operation. This means that there are also limits to the usefulness of the regression results for other systems. It is for this reason that the calculations of average cost per participant hour in the next chapter use the actual Reading costs per hour and not estimates based on the results presented in this section.

Finally, it should be noted that by the end of the year the minimum cost had fallen by another $9 per half-hour segment.[3] Thus, $40 per half hour is closer to the minimum cost which would be experienced under normal operating conditions, when the staff, agency personnel, and volunteers have all gained experience with the system. However, it should be noted that this low cost is a reflection of the heavy use of volunteer labor, which was valued at half the market price of other labor inputs. Where volunteers are not available or heavy use has to be made of skilled personnel for the kinds of services which it is desired to deliver interactively, costs are likely to be more than double this estimate.

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[3] Another way of putting this is that a linear learning curve effect for the first year only is assumed. This fits the Reading experience well, but may not extrapolate to other situations. In particular, any interaction between duration of segment and learning effect will bias the results.

Estimates of Average Costs Per Segment Including Overhead

Apart from the negligible non-labor costs so far included, the cost estimates presented in this chapter have been the direct manpower costs of producing interactive programming. In this final section, the appropriate overhead cost to be allocated to each hour of programming is calculated to provide a measure of the full cost of interactive programming.

Overhead costs represent that portion of the total cost of operating the NCC system for the one-year experimental period which was not directly assignable to specific interactive programming. These can be viewed as the overhead expenses of running the system: the cost of space, utilities, maintenance of equipment, supplies, and that part of the total time input by NCC system staff during which they are not working directly on the production of specific interactive programs. These overhead costs have been estimated by deducting the total manpower costs for NCC staff directly related to interactive costs from total operating costs, and dividing by the number of hours of programming.

The average operating costs were estimated in the section of this report "Costs of the Reading Interactive System and Alternatives for Replication." Estimated costs for Phase I and Phase II for the recommended system were $13,662 and $9,182 per month respectively. Monthly operating costs for Berks Community TV are currently $8,283. The estimated costs for the recommended system include a cost for cable maintenance which the ATC-Berks Cable TV Co. currently absorbs and slightly higher staff costs. None of these estimates are really appropriate. The Phase I and II figures, on the one hand, are for a recommended system, not the actual Reading system. On the other hand, the Berks Community TV costs are for regular operations after the learning period is over, while the manpower costs have been calculated for the initial year during which average costs fell because of increased experience and efficiency. Actual Reading costs for the year would be inappropriate because of the additional work for research and experimentation under contract.

Since there was no clearly appropriate estimate for total costs which was comparable with the manpower cost estimates, overhead costs were calculated using both Phase I and Phase II operating costs. An average of high and low estimates for overhead yields an hourly estimate of $160 for the experimental year. The details of the calculations and a fuller discussion can be found in Appendix A. Table 2.9 contains the estimates of NCC average costs per hour

Table 2.9

Average Total Costs Per Hour by Major Service Category in Reading Interactive System

SERVICE CATEGORY	NCC COSTS		OTHER COSTS		FULL COST
	NCC Man-power	Total Including Overhead	Agency Man-power	Elderly Volun-teers	Columns 2+3+4
	(1)	(2)	(3)	(4)	(5)
I. INFORMATION AND REFERRAL	$	$	$	$	$
A. Outreach					
1. Food Stamps	160	320	51	43	414
2. Other Public Assistance	138	298	110	27	435
3. Housing, Transportation, and Legal	161	321	65	17	403
4. Direct Banking Option	138	298	33	5	336
5. BCSCC Activities	104	264	56	5	325
6. Other Services	87	247	36	50	333
B. Interaction with Service Suppliers					
1. Social Security	143	303	43	18	364
2. Local/State Gov't.	122	282	28	35	345
II. DIRECT DELIVERY					
A. Form Filling					
1. Earned Income	127	287	18	9	314
2. Medicare	105	265	33	22	320
3. Rent Rebate	125	285	36	28	349
B. Education					
1. Consumer Education	75	235	28	59	322
2. Health Education	99	259	77	17	353
3. Other Education	90	250	34	23	307
C. Recreation					
Recreation-Social	107	267	4	37	308
III. AVERAGE*	103	263	28	36	326

* Weighted by hours of programming.

including NCC manpower costs and overhead for each social service topic. The costs of agency staff and elderly volunteers are also included. Finally, the full economic cost per hour of programming is shown, which is the addition of the NCC, agency, and volunteer costs. Full costs ranged from $300 to $440 per hour, with NCC costs accounting for the major portion. Five social service topics had agency hourly costs of more than $50; these were the more complex topics, food stamps, other public assistance, housing, transportation and legal, BCSCC activities and health education. There were four topics in which volunteer input per hour was worth more than the agency input; these were other outreach services, local and state government interaction, consumer education and recreation.

CHAPTER 3

AVERAGE COSTS PER PARTICIPANT HOUR IN READING

In this chapter, estimates of the average cost per participant hour for the major social service categories and topics are presented and the effect of the extension of reception to home viewers is discussed. These estimates were made in order to show the relationship between the hourly costs presented in the last chapter and the audience which the programming reached. This is the closest approximation possible with this data to the cost effectiveness of the interactive system. The results are used, first, to make comparisons with the costs of delivering similar services by other methods wherever possible and, second, to show how the expansion of the system reduces these costs substantially.

Although the measures of average cost per participant hour are not strictly appropriate for cost effectiveness comparisons, they do enable the relative popularity of the different services and service topics delivered over the interactive system to be assessed in their impact on the costs of delivering the different services. This is certainly one way to measure the relative effectiveness of the different interactive services, since it does represent a behavioral response. It is a behavioral response to the interactive programming although it does not show what service output was actually utilized (or how). This is partly because there is no satisfactory measure of the quantity of service or information which a given program delivered. In addition, there is no way to assess the quality of that output, except as reflected in differences in the effective draw of different social service programs. The long range goal of the service delivery is to bring about changes in the attitudes and behavior of the target group; for example, to increase use of a service or improve consumer efficiency of a service. Ideally, the target group of a system which delivers the information "well" will change their behavior in a way which could be measured as an indicator of the success of the system. But there is no way to distinguish the delivery effectiveness of the interactive system from all the other factors which determine the demand for a service. For example, if citizens really do not want the service, the interactive delivery will make no difference to its uptake.

This chapter is divided into two main sections. In the first, the information on costs per participant hour by social service is presented. Each social service is discussed in terms of its goals, the effectiveness of the interactive programming, and comparisons with other service delivery methods wherever possible. In the second section, the impact of extending the system on these hourly participant costs is discussed.

Average Costs Per Participant Hour by Social Service Category

Table 3.1 presents the estimates of participants per hour, average costs per hour, and average costs per participant hour for the five main social service categories. The estimation of average hourly costs was discussed in detail in the last chapter. The NCC

Table 3.1

Average Costs Per Participant Hour by Major Social Service Category in Reading Interactive System

	I Information and Referral		II Direct Delivery		
	A. Outreach	B. Interaction	A. Form Filling	B. Education	C. Recreation/Social
PARTICIPANTS PER HOUR (Number)					
TOTAL HOURS	62.4	42.7	6.4	112.4	145.8
Participants:					
NCC Attendance per hour	60	71	29	28	61
Converter Viewers per hour[1]	46	54	22	21	46
TOTAL PARTICIPANTS	106	125	51	49	107
AVERAGE COSTS PER HOUR (In dollars)					
NCC System Costs[2]	$262	285	278	248	267
Agency Costs[3]	$ 45	30	32	46	4
TOTAL COSTS PER HOUR	$307	$315	$310	$294	$271
AVERAGE COSTS PER PARTICIPANT HOUR (In dollars)					
NCC System Costs	$2.47	2.28	5.45	5.06	2.50
Agency Costs	$0.43	0.24	0.63	0.93	0.04
TOTAL COST PER PARTICIPANT HOUR:	$2.90	$2.52	$6.08	$5.99	$2.54

[1] See Appendix B, Sections 1 and 2, for estimating procedures.

[2] NCC System cost includes direct manpower costs and estimated overhead.

[3] Agency cost is the value of the manpower input of agency personnel.

system costs include the average cost of NCC staff used to produce an hour of programming and a share of overhead expenses for the operation of the NCC system, while the agency cost is simply the value of the manpower provided by agency personnel. The NCC attendance data was collected during the experimental period. The estimates of converter viewers were calculated from data available in the second survey of the elderly and are explained more fully in Appendix B. Finally, the cost per participant hour is calculated by dividing the average cost per hour by the total participants per hour and represents the cost of presenting one hour of programming to one individual.

The average costs per hour ranged from $270 for recreation to $315 for interaction with service supplier. Individual topics varied far more than this and will be discussed below. Average costs per participant, however, showed much larger differences reflecting the considerable differences in the effectiveness of the social services in attracting participants. Interaction with service supplier drew the largest audiences, 125 per hour, followed by recreation and outreach with 107 and 106; the least popular were form filling and education, with half the participants. These last two services were therefore much the most expensive in terms of their average cost per participant hour. Interaction with service supplier and recreation were the lowest cost at roughly $2.50 per participant hour.

Some of the major reasons for variation in average hourly costs were discussed in the last chapter. Part of the differences were due to the time at which the programming on a particular topic was produced and part to the intrinsic differences in manpower requirements for programs on different topics. Attendance at the NCCs increased over the one year period as the system became better known and more popular. Therefore, the differences in the average number of attendees per hour for each topic is also partly due to the time (in the life of the system) at which the programming was presented and, partly, to the general preferences of the target audience for specific topics.

Theoretically, all interactive programs could have the same numbers of attendees per hour, since the physical capacity of the NCCs is always the same. However, the amount of labor required to present a program might be sensitive to the number of participants for certain services. In addition, the success or effectiveness of a system such as this is largely dependent on its ability to attract participants. A social service cannot be delivered via the system to persons who do not attend or who do not watch the programming at home. Therefore, the cost measures for each topic have been assessed in terms of the actual costs incurred and the actual number of persons reached. However, it should be recognized that the average cost of producing one hour of programming is relatively fixed over the range from zero to approximately 90 attendees per hour. Theoretically, the average cost per person, per hour, would fall continually as audience size increased. Table 3.2 contains comparative data on the number of participants and average cost per participant hour for fifteen social service topics.

Table 3.2

Participants and Average Costs Per Participant Hour by Social Service Topic in Reading Interactive System

SOCIAL SERVICE TOPIC	TOTAL HOURS	AVERAGE PER HOUR			
		Total Participants	NCC Costs Per Participant Hour	Agency Costs Per Participant Hour	Total Costs Per Participant Hour
I. INFORMATION AND REFERRAL			($)	($)	($)
A. Outreach					
1. Food Stamps	3	85	3.77	.60	4.37
2. Other Public Assistance	5	92	3.24	1.19	4.43
3. Housing, Transportation, and Legal	5	76	4.22	.86	5.08
4. Direct Banking Option	2	64	4.65	.52	5.17
5. BCSCC Activities	4	94	2.81	.59	3.40
6. Other Services	45	115	2.15	.32	2.47
B. Interaction with Service Supplier					
1. Social Security	6	116	2.61	.37	2.98
2. Local/State Gov't.	37	127	2.20	.22	2.42
II. DIRECT DELIVERY					
A. Form Filling					
1. Earned Income	1	49	5.85	.36	6.21
2. Medicare	2	59	4.49	.57	5.06
3. Rent Rebate	3	45	6.33	.79	7.12
B. Education					
1. Consumer Education	37	46	5.63	.60	6.23
2. Health Education	42	43	5.46	1.79	7.25
3. Other Education	33	59	4.24	.57	4.81
C. Recreation					
Recreation-Social	146	107	2.50	.04	2.54

Information and Referral: A. Outreach

The NCC system was used by various local social service agencies to inform elderly participants about the services and benefits offered by their agencies in this category of programming. The immediate goal was to increase the knowledge and awareness of the elderly about these services. The long-range goal was to increase the uptake of these services by the elderly.

The distinction between outreach and the next category, interaction with service supplier, is that outreach programming was aimed primarily at persons who were not already enrolled in, or using, the services. This includes both current and future eligibles. The system was used to inform people about services such as free transportation to the doctor or homemaker services for the ill which they might not currently require but might need in the future. In addition, outreach programming was aimed at changing the attitudes of the community as a whole toward certain stigmatized services such as food stamps, with the expectation that a powerful barrier to the use of these services could be removed.

The NCC system therefore had three goals for outreach programming:

1. Informing and referring present eligibles about services and benefits offered by local agencies, explaining how eligibility is assessed, where and how to enroll for the service, and the nature of the services being offered.
2. Informing potential future eligibles about these services.
3. Educating the community-at-large about these services or benefits and about those who use them.

While other outreach facilities have the same goals as the NCC system, it is difficult to equate them. Most traditional outreach activities fall into one of two categories: individual counseling and referral, and mass media outreach campaigns. The outreach provided by the NCC system contained elements of both. It resembled the mass media in that it allowed service providers to reach a large number of persons at one time. It was also similar to individual counseling because it provided an opportunity for target individuals to ask questions, articulate problems or needs, and supply feedback.

Outreach programming was conducted on a number of services, including:

Food Stamps
Medicaid
Other services of the County Board of Public Assistance
Social Security-Direct Banking Option
BCSCC services and activities
Transportation services for the elderly
Legal services offered by local agencies
Recreational services offered by local public and private agencies
Health services
Financial services.

These have been broken down into six topic categories in Table 3.2.

The outreach topic with the lowest cost per participant hour was 'other services' at $2.47. It was this low because the programming was relatively inexpensive to produce ($283 total per hour), and because it enjoyed a relatively high average rate of attendance. Far more programming was done on this than on any other outreach topic. It is uncertain whether the amount of programming done on that topic affected attendance; it clearly reduced the cost per hour. Given the relatively low number of hours of programming done on the first five topics in Table 3.2 and the fact that the programs were produced at different times during the experiment, it is not possible

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to state with certainty what part of the differentials in attendance figures are due to intrinsic differences in the popularity of these topics. The findings from the panel survey of senior citizens is contained in a separate report which includes a detailed analysis of participation in the NCC system.[4]

Overall averages for outreach programming are given in Table 3.1. In a one-year period, the system presented a total of 62 hours of outreach programming (about 17 percent of total programming time). An average hour of outreach reached 60 persons at the NCCs and 46 persons with converters for a total of 106 persons. This estimate of the number of persons reached does not include the cable-subscribing households who were in fact able to receive the experimental programming in their homes as of October 1976.

Overall, the outreach services offered by the NCC system cost $262 plus $45 per hour for agency staff time. The total average cost is $307 per hour. If this programming were available only to individuals who attended the NCCs and if the average attendance corresponded to that which occurred at the NCCs (60 persons per hour), the total cost would then be $5.11 per person, per hour of outreach. If attendance could be increased to the maximum reasonable NCC capacity (100 attendees per hour--which could occur without an increase in cost), the cost for outreach falls to $3.07 per person per hour. This cost is relatively low when compared with individual referral provided at an agency. Assuming that the labor of agency personnel is valued as it was here, the cost of this input alone, $5.49 per hour, (not counting any overhead costs or transportation costs for the elderly service recipient) puts the cost per person per hour at an agency well above that at which the NCC system provided this service.

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[4] See: "Impact of a Neighborhood Communication Center System on the Elderly in Reading, Pennsylvania" in Volume 2.

However, as noted earlier, the outreach service offered by the NCC system is not strictly comparable with individual counseling and referral, for it embodies some characteristics of mass-media outreach as well. If the 46 home viewers per hour are now included, the cost of outreach programming falls to $2.90 per person, per hour, in terms of actual recorded attendance. However, this estimate is an arbitrary number which was determined by the total number of persons provided with converters at the outset of the experiment, which is 117. The number of converters was a given feature of the design of the experimental system. It is clear that all the interactive programming becomes more cost effective when home viewers are added to the system. A study made of the outreach for Supplemental Security Income in Pennsylvania from March to August 1974 found that in Berks and Schuylkill counties 11,329 person-to-person contacts were made for a total expenditure of $33,000 or $2.90 per contact.[5] Of the contacts, roughly a quarter were by phone, a quarter by home visit, a quarter by mail and the rest in booths, agency offices, and education meetings (Table II.D.1, p. 21).

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[5] Community Services of Pennsylvania, Good Neighbor Supplemental Security Income Alert, Report to the Department of Public Welfare, August 31, 1974. See Table II.E, p. 22 and Table III.E.2, p. 40.

Information and Referral: B. Interaction with Service Supplier

The interactive programming in this category is not directly comparable with activities normally carried out by service-providing agencies or groups in Reading. This programming brought together groups of elderly service users with personnel or officials of the service-providing agencies (the local administrators of social security and local government officials). The goal of this programming was to provide an opportunity for these two groups, consumers and suppliers, to meet and to communicate with each other. The communication was intended to improve the service supplier's awareness of the problems and needs of their clientele and to make the elderly more knowledgeable and comfortable about using the services. Both of the topics on which this programming was done involved services for which the great majority (or all) of the elderly persons in the target group were 'eligible.'

Comparing the overall average cost-per-hour of programming for interaction with service supplier with that for outreach programming, it can be seen that the former is somewhat less expensive per hour in terms of both NCC system costs and agency input. The service supplier programming also enjoyed a higher overall average rate of attendance. One hour of interaction with service supplier was supplied by the NCC system during the first year of experimentation for a total average cost of $2.52 per person reached.

It is difficult to think of an alternative means of delivering this same service with which to compare the cost effectiveness of the NCC system. If the mayor or the administrator of the local Social

Security office wished to meet with 100 elderly persons for an hour, it would hardly cost less than $315. No attempt will be made to estimate the cost of arranging a meeting between a service supplier and 100 elderly persons non-interactively. But it is interesting to speculate about how the costs for such a meeting might differ from those for the NCC interaction.

The only NCC cost which would not exist for an in-person meeting would be the costs for video equipment and technicians. Publicity costs might be somewhat higher were the NCC system not used because it would be necessary to find some way of informing people about the event. Clearly the most important area of difference between an interactive meeting of several sites and getting the same participants to one location is the saving which the system offers in time and travel costs for all participants. NCCs are located near the elderly and those with converters can participate from their homes. This may mean that the elderly can participate more cheaply in terms of their own time and travel. In addition, it may mean that for some, particularly those who cannot travel easily, the NCC meeting is the only way that they could attend.

If it is assumed that about one-third of the elderly participants could or would not travel on their own to the mayor's office or to the Social Security office, and that special transportation would have to be provided to them for an in-person meeting, the cost for such a meeting would then clearly exceed that for the NCC interaction. In addition, since the NCC interaction cablecasts from the office of the service supplier, it is economical in terms of their time. The average cost to the service supplier for an hour of programming over the NCC system including the time needed for preparation was $30. It is doubtful that any other medium could provide this interaction at such low cost.

But the real source of efficiency in the NCC system lies in the nearly zero marginal cost of extending an interaction with service supplier to additional participants. These results are based on an estimate of 54 home viewers per hour. This number of home viewers was restricted for the experimental system because only 117 homes were supplied with converters. Some estimates will be made based on different assumptions about the number of home viewers in the second part of the chapter. It is clear that the cost of programming per participant hour will fall for the NCC system as the number of home viewers increases, since the average total cost per hour of producing this programming will not change.

One final point concerns the optimal duration of an interaction with service supplier program. These programs were relatively short in length, an average of 28 minutes each. One of the special attributes of the NCC system was that it permitted frequent, brief interaction to take place between the elderly and the service suppliers. This was seen by both as the optimal pattern for these interactions. If the costs of four single-location in-person meetings of fifteen minutes each, or the cost of two half-hour meetings are compared, it becomes clear that these one-site meetings would cost considerably more than the NCC interactions. Travel costs would be incurred on each occasion for the one-site meetings and the likelihood of substantial elderly attendance at each of these might be slight.

The cost for the NCC system of producing an average interaction with Social Security was $79 and the average length of such a program was 16 minutes. It is clear that no one-site meeting of 100 elderly persons and the Administrator of Social Security could easily be produced for $79. The average total cost to Social Security for such a meeting over the NCC system was $11. It is again unlikely that any other means of producing this interaction would cost the agency so little. The effectiveness of the local and state government interaction programming in terms of its impact on those who participated is analyzed in much greater depth in the report on community involvement.[6]

Direct Delivery: A. Form Filling

The interactive programming in this category used the NCC system to perform a function which was concurrently carried out in Reading by two agencies: Social Security and Berks County Senior Citizens Council. This programming supplied elderly system participants with information and assistance in making out various forms which are required in connection with obtaining or using certain services or benefits. The goals of this programming were:

1. to permit service suppliers to assist service recipients in filling out these forms in a manner that was more efficient for both the elderly and the agencies.

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[6] See: "Citizen Participation Through Two-Way Cable Television" in this volume.

2. to increase the competence of the elderly in filling out these forms so they might become more capable of completing them on their own.

This programming was carried out on three topics; that is, three kinds of forms: Earned Income reports, Medicare Claim forms, and Rent Rebate forms.

On the average, one hour of form filling programming costs slightly less than an hour of outreach or interaction with service-supplier programming in terms of NCC system cost. Form filling costs substantially less than the other two in terms of agency time. However, since average attendance at this programming during the experimental year was quite low compared with that for any other category of programming, the average cost per person was high. In spite of this, NCC form filling was still relatively efficient when compared with the cost of supplying this service to the elderly in person at a local agency.

Even with the low attendance, this service was supplied at an average total cost of $6.08 per person per hour. The savings come about because the NCC system substitutes elderly volunteers and NCC system staff for agency personnel. In addition, a larger number of elderly persons can be helped simultaneously over the NCC system with individual attention given only to those who need it. Each elderly person is helped individually at the agency which is far more expensive in terms of agency staff time. Furthermore, supplying this assistance over the NCC system saves the elderly travel costs and the time normally spent waiting at the agency.

It is questionable, however, whether the quality of the social service product being offered by the NCC system is the same as the agency alternative. The help offered by the NCC system was not seen by the elderly as an acceptable substitute for individualized attention at an agency, which it appears is very important to the elderly. It increases their confidence that the forms will be filled out correctly. In the NCCs, on the other hand, there is an opportunity for the elderly to become more knowledgeable and self-sufficient about filling out forms and there, too, they were guaranteed that a trained person would check over the completed forms to ensure their correctness. Nevertheless, there was considerable reluctance on the part of the elderly to participate in these sessions or to actually use the session to fill out their own forms. Many of those who did attend would only fill out practice forms and then make an additional visit to the agency.

Comparatively little programming was actually produced on this topic because the senior citizens were reluctant to participate in it. Participation at the NCC sessions was always purely voluntary and the local agencies in Reading continued to offer individual help concurrently at their offices. Therefore, it is difficult to determine whether the reluctance of the elderly to participate in such programming would have diminished over time.

Direct Delivery: B. Education

This category of interactive programming included lectures, talks, discussions, and demonstrations by experts on various topics including consumer education, health care, and subjects of general interest such as gardening, and yoga. Frequently, the experts were volunteer elderly participants. The format of these programs involved a considerable amount of interaction between presenters and participants. In fact, much of the interactive programming done by the system could be viewed as educational since it involved the presentation and exchange of information. The specific programming in the education category differs from the rest only because it dealt with subjects other than outreach on services, use of services, local government, or form filling. As such, it is a catch-all category for the informational programming which did not fall into one of the previously discussed categories.

One goal of this programming was to provide a medium for elderly individuals with expertise on a given subject to share it with other elderly people. A second goal was to provide elderly participants increased access to other sources of information and education in the community such as schools and other local groups, like the Red Cross.

On the average, an hour of education programming costs the NCC system slightly less to produce than any of the previously discussed categories. It cost the agencies about the same amount per hour as outreach. However, education programming had relatively fewer participants per hour than the other categories; thus, the cost per person per hour is greater than that for any other function except form filling, which also had a low rate of attendance.

The cost effectiveness of using the NCC system to deliver education programming lies in its capacity to provide the elderly with access to informational resources in the community and an opportunity to interact with them more efficiently than any alternative method. The alternative to the NCC system in Reading was for the elderly to travel in person to the agency or institution providing education. The question is whether the total cost of preparing and presenting an educational session or class, including the cost of transporting the elderly from their homes to the agency, could be accomplished for $6 per person or less, which is quite probable. However, if these educational sessions are optimally about one-half hour in length (as they were over the NCC system), travel costs would be incurred twice for one hour of programming. In other words, a single half hour session would have to cost $3 per person, including transportation, to match the efficiency of the NCC system. It is doubtful that an in-person, one-site class or session could be produced at so low a cost. This becomes even more unlikely if it is assumed that many of the elderly would require special door-to-door transportation.

Finally, these cost per-person per-hour estimates for the NCC system are directly determined by the demand for this programming by the elderly during the one-year experiment. Considering factors such as bad weather and the limited mobility of many of the elderly, it is likely that an in-person class at one site would have lower attendance rates than the NCC system, no matter what transportation facilities were offered. In short, it is probably impossible to provide educational sessions to as many elderly at lower cost by other methods. The evidence from the Reading experience, however, is that the greatest payoff is for home viewers. The preferences of cable subscribers described in section 2 of Appendix B shows that educational programs were the only major social service category in which there was a substantial divergence of preferences between home viewers and NCC attenders; indeed, educational programs were watched almost as often as the three most popular by home viewers, while education and form filling had average attendances of 30 compared to 60-70 for the other categories. The data presented above assumed similar preferences for home viewers and NCC attenders.

Direct Delivery: C. Recreational-Social Interaction

For this category, the NCC system was used to provide the elderly with an opportunity to discuss personal issues, local folklore, and history, as well as to participate in group-singing and poetry-reading sessions.

This programming together with outreach was the best attended and the cost per person of $2.54 per hour was the lowest of any category. NCC system costs for this were similar to those for outreach and interaction with service supplier, but agency costs for an hour of recreation were the lowest of any category. The effectiveness of this programming will not be analyzed here in terms of specific impacts on the elderly participants. The report which describes the survey findings on the impact of interactive programming on the elderly in Reading examines the effects closely.[7]

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[7] See: "Impact of a Neighborhood Communication Center System on the Elderly in Reading, Pennsylvania" in Volume 2.

Summary of Findings on Average Cost Per Participant Hour

Three hundred and seventy hours of interactive programming were produced on the experimental system in Reading. It cost approximately $300 to deliver each hour of programming.[8] The system reached an average of 52 elderly persons per hour in the NCCs and 38 converter-equipped home viewers. Therefore, the average cost per person at which the system delivered an hour of social service programming was $3.30.

This cost differed for the various categories of social service functions performed by the programming. For three of these categories, outreach, interaction with service suppliers, and recreation-social interaction, the NCC system performed the social service function at a cost per person below the cost of providing the service in person at one central site, if the cost of transporting all the elderly serviced by the system to that site is considered. The cable system's superiority lies in its ability to give isolated or relatively immobile elderly people access to services normally available only at locations distant from their homes and to service suppliers or government officials whose time is scarce; consequently, they do not normally travel around the city to meet and talk with the elderly in or nearby their homes.

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[8] $300 is the average of the five social service categories presented in Table 3.1. This is $10 more than the average (excluding volunteer labor) presented in Table 2.9; this average was weighted by total hours of programming which are accurate costs for the Reading system but given the preponderance of the cheaper recreational programming, give a biased measure of costs by service category.

Whether the outreach services provided by the NCC system were effective, in terms of the long-range impact on the uptake of services, is not clear from the data collected during the experimental period. Since the goal of outreach is to increase uptake of services, it may be that relatively less expensive, one-way, mass-media methods are equally effective for outreach purposes. It is clear, however, that the NCC outreach was performed at a cost per person below that of in-person outreach, counseling, or door-to-door efforts such as the SSI Alert, and it has the advantages of interaction, such as the immediate feedback from the clients.

The other two functions performed by the NCC system, form filling and education, came in at a substantially higher cost per person, per hour. An hour of programming on each of these services did not cost more than the others to produce, but both form filling and education attracted substantially fewer elderly participants per hour. In fact, the low demand for form filling made it impractical to use the system to deliver this service; only 2% of total programming was devoted to this function. Since efficient delivery of a service via the NCC system is dependent on the audience demand for that service by the potential target participants, it must be concluded that the system was unable to perform this service as efficiently as it is traditionally delivered in person at the agencies. However, the total demand for both these services was constrained by the total number of homes with access to it. It is possible that the system could deliver both of these services more efficiently if a larger target audience were available.

Impact on Average Participant Costs of Expansion of System

The analysis up to this point has been based on two determinants: the costs actually incurred to produce the NCC programming and the participation in that programming. The purpose of the experiment was to explore both. However, over certain ranges, the NCC system (like one-way broadcast TV) has the capacity to extend its programming to additional viewers and attendees at a very low or zero marginal cost. This is where the chief potential efficiency of the system lies, for as the number of persons reached per hour rises, the cost per person falls. If a community is already wired for cable, a majority of homes subscribe, and the programming is transmitted over a regular public-access channel at no cost for the downstream cable, the marginal cost of adding homes is zero. Average costs per participant hour will fall for each home added. The extent of the decrease will depend upon the number of viewers per hour added for each new subscriber. The number of viewers per hour will be determined by two factors: (1) the number of subscribers and (2) the proportion of subscribers watching the relevant programming per hour. Since the interactive programming was transmitted to all subscribing homes on Channel 3 after October 1976, it was possible to estimate the effect of this costless expansion on average cost per participant hour; the findings are presented below.

However, it is not always possible to expand the system costlessly. There are four situations where considerable costs may be involved:

1. The community is not wired for cable reception.
2. There is no channel nor channel time available.
3. There are charges for the downstream cable use.

4. The audience for whom the programming is intended are not subscribing.

5. The interactive programming is being transmitted on a dedicated channel which is not available to regular subscribers.

Obviously, the costs of wiring a community would be prohibitive for public interactive programming alone and is not considered in this study. As long as the programming is for public services and cable franchises ensure the availability of public access channels in sufficient numbers, the next two factors will not be a concern. The fourth situation was not a problem in Reading where 80% of the homes subscribe, but might be a serious problem elsewhere. It also presents particular problems for equity in the delivery of public services, when low income families cannot afford cable reception. In such cases, it would certainly make sense to consider paying the subscriptions for selected groups, such as the bedridden. In Reading, a nursing home was also connected. It is worth noting that it may only be necessary to pay the installation charge and an initial subscription period; of the 26 homes whose subscriptions were paid by the experiment and which had not previously subscribed, 17 continued to pay their subscription after the experiment ended.

For the first eight months of operations, the Reading interactive system was transmitted over the dedicated Channel G, so that homes had to have a converter installed in order to receive the programming. The reduction of costs per participant hour from expanding the system were therefore offset to some extent by the cost of converters. In the second section below, the effect of additional home viewers on average costs per participant hour in Reading are calculated and the number of homes which it is necessary to connect to reduce average cost per participant hour to 13 cents (the cost of first-class mail), is estimated.

Expansion of the NCC System to Regular Cable Subscribers

In its tenth month of operation, the experimental NCC system began to send out a one-way downstream signal to the 35,000 regular subscribers to ATC's Berks Cable TV Co. One month later, and again six months later, mail surveys were administered to a sample of the 19,000 cable subscribers in downtown Reading to estimate the frequency with which they viewed the interactive programming. The results of these surveys are detailed in section 3 of Appendix B.

The survey results indicate that approximately 12,000 or 40% of the private households subscribing to Berks Cable TV Co. contained at least one person aged 60 or over. From the two later surveys conducted, it is estimated that during the six months in which interactive programming had been available, 5,519 households, or 46% of those surveyed with an elderly resident, reported that they had watched BCTV at least once. This occurred with minimal advertising to cable subscribers of the availability of BCTV programming for the elderly.

Based on the viewing frequencies reported by respondents, it is stimated that in the first six months in Reading each 100 cable-bscribing households with elderly yielded approximately:

13.3 people who watched regularly 2-5 times per week,
3.1 people who watched regularly once a week,
16.6 people who watched more than once or twice but not regularly, and
11.2 people who watched once or twice only.

This contributes a probable 7.3 viewers per hour of programming for every 100 elderly cable subscribers (See section 4 of Appendix B for details of the estimating procedure).

The cable operator in Reading made no charge for the use of the downstream cable channel to send out this programming. The extension of the system was thus carried out without any change in the cost per hour of producing programming or of operating the NCC system. The survey results indicate that the 11,998 elderly cable subscribing homes in Reading contributed an average of 876 elderly persons to the total number reached by each hour of the interactive programming. Table 3.3 lists the actual costs per person incurred by the NCC system per hour for the various social services delivered and estimates of the cost per person per hour assuming an added 876 persons reached through regular downstream cable.

These estimates are made on the assumption that home viewers have the same preferences for the different social service programming as participants at the NCCs. Thus, there is no difference in the relative position of the average cost per participant hour by service before and after the extension to cable subscribers. The extension of the NCC system to all local cable subscribers was not part of the original research design, and only the small-scale surveys described in Appendix B were possible. These provide evidence of similar viewing

Table 3.3

Average Cost Per Participant Hour by Social Service Category Before and After Extension to Berks Cable TV Co. Subscribers

Function	Average Cost Per Hour of Producing Programming	Average Cost Per Participant Hour Before Extension of System	Average Cost Per Participant Hour 6 Months After Extension
Outreach	$307	$2.90	$ .26
Interaction with Service Supplier	315	2.52	.23
Form Filling	310	6.08	.55
Education	294	6.00	.54
Recreation-Social Interaction	271	2.53	.23

preferences; the one exception was education which was watched more at home than in the centers.

Because the marginal cost of extending programming to all cable subscribers was zero, the decline in average cost per participant depends upon the increased audience at home. Nevertheless, the fact that the extension of the NCC system produced an average of 876 additional households with elderly members watching each hour of programming means that all the social service topics enjoyed substantial increases in their audiences and, therefore, substantial reductions in the cost per person at which they were delivered. This response by elderly cable subscribers is especially impressive given that it occurred within only six months and without any special announcements or advertising. On the second survey, nearly 68% of those who had not watched the programming had also not heard about it, and on both the mail and phone surveys a substantial proportion of the non-viewers expressed an interest in the interactive programming when it was described for them.

Expansion of NCC System with Converters

For the Reading experiment, 117 homes with elderly residents were given converters, and could therefore view the programming one-way and interact by phoning in. It is estimated that from the 117 homes there was a probable audience of 38 per hour for the interactive programming (see section 1 of Appendix B). In other words, adding one elderly home equipped with a converter brought an additional 0.33 viewers per hour to the number reached by the system.

The additional cost per converter will depend upon the cost of installing the converters and the monthly subscription rate. In Reading, these costs were borne by the experiment. The monthly subscription rate was $6, but the installation costs are more difficult to estimate. Details of alternative costs under different assumptions are presented in section 5 of Appendix B. The upper and lower limits to the cost per converter per hour in Reading are estimated at 30 cents and 20 cents respectively.

Since each converter adds .33 viewers per hour and costs from 20 to 30 cents, each added viewer costs from 61 to 91 cents. Assuming that average cost per hour without the converters is $300 with an average of 52 participants per hour, the average cost per participant hour is $5.76. The addition of 117 converters reduces this cost to $3.78 when the converter cost is 30 cents and to $3.65 when it is 20 cents. These estimated costs are based on the assumption that the NCC program viewers would increase as a constant proportion of the increased converter-equipped homes. It is also clear that the cost per participant hour will decrease more for those services which are watched more and less for those which are watched less. Furthermore, to the extent that home viewers have different programming preferences compared to the center participants, the average costs per participant hour by social service category may change the relative position of the various social service categories. For instance, there was some evidence that educational programming was more popular at home than in the centers; this would mean that the extension of the interactive programming to homes reduced the average cost per participant hour of educational programming more than is indicated by the linear projection of center viewing preferences.

The effect of expanding the one-way reception of the interactive programming at some cost can be generalized. If x = the number of additional connections provided, the average cost per participant hour (Cp) can be expressed as follows:

$C_p = \frac{C}{P}$ = Average cost per participant hour

C = Average cost per hour = $C_I + C_c x$

P = Average participants per hour = $P_I + P_c x$

where:

C_I = Average cost of interactive programming per hour

C_c = Average cost per additional connection per hour

P_I = Average number of participants at centers per hour

P_c = Average number of viewers per additional connection per hour.

Therefore, the average cost per participant hour can also be written as follows:

$$C_p = \frac{C_I + C_c x}{P_I + P_c x}$$

The reduction in the average cost which an additional connection brings can then be written:

$$\frac{dC_p}{dx} = \frac{(P_I + P_c x)\ C_c - (C_I + C_c x)\ P_c}{(P_I + P_c x)^2}$$

Conclusion

The effect of extending interactive programming to home viewers on the average cost per participant hour is summarized in Table 3.4. While the installation of 117 converters increased the number of elderly reached by 38 per hour, the average cost fell by $2 an hour, since there was also a cost for each additional converter. The extension to regular cable subscribers at no extra cost reduced average costs to 32 cents per participant hour. This decline makes delivery of these services considerably more efficient than any other two-way, interactive, or in-person medium. It should be remembered that these estimates of the number of people reached per hour after extension of the system are deliberately conservative and that little publicity was conducted to increase home audiences.

Finally, estimates of the number of subscribers which would be needed to reduce the average cost per participant hour to 13 cents, or the cost of a first class letter, are presented in Table 3.4. The table contains average cost estimates based on different assumptions about the number of viewers per 100 subscribers, and about the proportions of elderly living in subscribing homes. In Reading, there were an estimated 7.3 viewers per 100 elderly subscribers and 40% subscribing homes with a person over 60. This would mean that there would have to be 77,260 subscribers to reduce the average cost per participant hour to 13 cents. However, if greater publicity increased the number of viewers per hour to 10, only 56,400 subscribers would be necessary. By contrast, if there were fewer

Table 3.4

Reduction in Average Cost Per Participant Hour
by Extension of NCC Interactive Programming
to Home Viewers in Reading

	Number of Elderly Reached Per Hour	Average Cost Per Participant Hour
I. In Reading: Average Cost Per Hour = $300		
NCC system	52	$5.76
NCC system with 117 converters*	90	3.65
NCC system with 11,998 elderly subscribers	928	.32
II. Number of Elderly Reached Needed to Reduce Cost From $300 to $.13 Per Hour		
Number reached per hour	2,308	.13
Number home viewers per hour	2,256	.13
III. Number of Subscribers to Yield 2,256 Elderly Home Viewers Per Hour		Elderly Subscribers
(a) Number of Elderly Subscribers		
At 5 viewers per 100 elderly subscribers		45,120
At 7.3 viewers per 100 elderly subscribers		30,904
At 10 viewers per 100 elderly subscribers		22,560
(b) Number of Total Subscribers		Total Subscribers
1. With 40% subscribers with person over 60 at 5 viewers per hour per 100 elderly		112,800
-at 7.3 viewers per hour per 100 elderly		77,260
-at 10 viewers per hour per 100 elderly		56,400
2. With 25% subscribers with person over 60 at 5 viewers per hour per 100 elderly		180,480
-at 7.3 viewers per hour per 100 elderly		123,616
-at 10 viewers per hour per 100 elderly		90,240

* At $.20 per converter, per hour.

elderly living in homes with cable, there would have to be more subscribers to yield the necessary number of viewers.

These figures are mainly illustrative, but do indicate that the number of subscribers does not have to be very large to reduce the average cost per participant hour dramatically. However, to the extent that cable subscribers are only a small part of the target population, these conclusions would not apply. In particular, if the interactive programming is intended for poorer citizens who cannot afford to absorb the cable costs, then the costs of extending the system might offset these reductions. If the cost of adding subscribers is not greater than it was in Reading, significant reductions could still be achieved over a significant range.

CHAPTER 4

UPTAKE ON SELECTED OUTREACH TOPICS IN READING

For certain outreach programs, specifically Food Stamps, Medicaid, and the Direct Banking Option, an attempt was made to measure the behavioral responses of target system participants to the programming offered by the NCC system. The primary problem was that data collection on the uptake of these services at the local agencies in Reading proved a formidable task which had to be set in motion before the start of the operating period. At that point, it was not clear for which specific topics and services outreach programming would actually be done. One of the primary system goals was to involve the elderly and the agencies directly in the selection of topics for programming and these decisions were therefore made after data collection mechanisms had been set up.

The outreach programming on Food Stamps, Medicaid, and the Direct Banking Option took only 9.79 hours or 2.7% of total interactive programming output. In addition, there were 79 spot announcements on these topics. Furthermore, many of these programs were presented during the early months of system operation when the active participant group was relatively small. Therefore, much of the target group being measured at the agencies was exposed to very little of the programming on the specific service.

Data was collected at the relevant local agencies on the total number of elderly persons in each of the experimental and control areas who came in and applied for or inquired about the programs on which outreach had been done. The four experimental areas included two public housing projects for the elderly which contained NCCs, Kennedy and Hensler, one residential neighborhood near Horizon Center and one neighborhood in which households had been supplied with converters to watch the NCC programming in their homes (the western section of Neighborhood 17). Data was also tracked on the rates at which elderly persons in three matched control groups without easy access to an NCC applied for these services. The control groups included two public housing projects for the elderly (Oakbrook and Franklin) and a residential neighborhood (Neighborhood 17 East). In addition, data were tracked on the application rates for downtown Reading as a whole, as distinct from the experimental and control areas. This last group was intended as a check on city-wide trends which might have been affecting application rates during the year.[9]

Food Stamps

Outreach programming was done on the federal food stamps program which is administered to residents of the Reading area by the Berks County Board of Public Assistance. This programming presented elderly participants with information on what the food stamps program is, who is eligible, where and how to enroll, and what the benefits are. It also provided them with an opportunity to ask questions and voice their needs and concerns related to food stamps. The goals were to increase the current uptake of food stamps by elderly eligibles and to increase future uptake by elderly who might become eligible through a change in income or life circumstances. The extent to which the NCC system achieved this goal can be measured by looking at data on the numbers of persons in each of the experimental and control groups who applied for food stamps.

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[9] However, it is not clear to what extent this group was not influenced by the interactive programming, as data were not available on the frequency of their contact with the NCC system. While it is certain that large proportions of this group did not attend NCCs during the first nine months of operation, during the last five months a significant number of persons in the "other downtown Reading" group did have access to the programming as it was then sent out to all regular cable subscribers.

Table 4.1 contains information on food stamps applications, estimates of the number of persons eligible for food stamps, and the frequency with which the interactive programming was attended or viewed. The estimates of the elderly who are eligible for food stamps in each area are based on income and other data from the Wave I and II Surveys in these areas. The details of how these estimates were derived can be found in Appendix C.

Table 4.1 shows that Kennedy residents, the group with the highest proportion of eligibles making applications for food stamps, also had the highest proportion of persons having contact with the NCC system. The group with the lowest application rates, Neighborhood 17 East, had the lowest proportion of people having contact with the NCC system. Otherwise, the findings are not clear; the two groups with the second and third highest application rates, Franklin and Oakbrook, were control groups with only a minor amount of contact with the NCC system.

Table 4.1

Eligibility and Applications For Food Stamps From Elderly by Experimental and Control Groups: November/December 1975 and January 1976/February 1977

I. ELIGIBILITY FOR FOOD STAMPS	Elderly Population 60 + (1)	Estimated Eligibles For Food Stamps (2)	Eligibles As Percent Population Col 2 ÷ Col 1 (3)	Percent Elderly Contact With NCC System[1] (4)
A. Experimental	#	#	%	%
Horizon NCC	1,341	348	26	32
Kennedy NCC	139	53	38	53
Hensler NCC	102	41	40	32
Home Viewers[2]	238	28	12	32
B. Control				
Downtown Reading[3]	17,290	432	25	n.a.
Franklin	50	24	49	11
Oakbrook	125	50	40	4
Home Viewers[2]	508	71	14	0

II. APPLICATIONS FOR FOOD STAMPS	Applications by Elderly: Nov/Dec 1975 (5)	Applications by Elderly: Jan 1976/ Feb 1977 (6)	Applications As Percent Eligibles Col 6 ÷ Col 2 (7)
A. Experimental	#	#	%
Horizon NCC	2	37	11
Kennedy NCC	3	18	34
Hensler NCC	1	9	22
Home Viewers[2]	0	5	18
B. Control			
Downtown Reading[3]	28	376	8.7
Franklin	7	7	29
Oakbrook	0	14	28
Home Viewers[2]	0	3	4

n.a. = not available

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[1] Data derived from survey questionnaire.

[2] Reading's Planning Neighborhood 17 was divided East and West. Converters were installed in West for the experiment; East was the control group.

[3] The rest of Downtown Reading excluding the experimental and other control groups.

Comparison between each experimental group and its matched control in Table 4.2 shows the application rates before and during the experiment for each matched pair of groups. The difference between each experiment group and its control (experimental minus control) is also shown. Only two experimental groups (Horizon and Neighborhood 17 West) displayed an increase in their relative positions during the experimental period. Both Kennedy and Hensler showed a decrease. In short, these findings do not present conclusive evidence of a consistent relationship between the amount of contact a group has had with the NCC system and the frequency with which its eligible population applied for food stamps. With the relatively small amount of NCC programming time devoted to food stamps outreach and the low level of contact with the system, it is not surprising that no clear trend can be detected.

Medicaid

Outreach programming was also done for the federal Medicaid health insurance program. Like food stamps, Medicaid is administered by the Berks County Board of Public Assistance. The NCC programming supplied information on why, how, and where to enroll for Medicaid, who is eligible, and what the benefits are. It also provided elderly participants at the NCCs with an opportunity to ask questions and voice their interests and problems in connection with getting or using Medicaid. This programming had goals similar to the food stamps programming: to increase uptake of Medicaid-eligible persons now and in the future and to increase general community awareness and acceptance of the program.

Table 4.2

Comparison of Application Rates for Food Stamps by Control and Experimental Groups Before and During the Experiment

	APPLICATION RATES[1]	
	Nov/Dec 1975	2 Month Average Jan 1976 to Feb 1977
	%	%
I. DISPERSED RESIDENTIAL AREA		
Experimental: Horizon NCC	0.6	1.5
Control: Neighborhood 17 East	0	.6
Experimental Minus Control	+ .6	+ .9
II. RESIDENTIAL TOWERS		
Experimental: Kennedy NCC	5.7	5.1
Control: Franklin	0	4.1
Experimental Minus Control	+ 5.7	+ 1.0
III. GARDEN APARTMENTS		
Experimental: Hensler NCC	2.4	3.2
Control: Oakbrook	0	4.0
Experimental Minus Control	+ 2.4	- .8
IV. HOME VIEWERS WITH CONVERTERS		
Experimental: Neighborhood 17 West	0	2.5
Control: Neighborhood 17 East	0	.6
Experimental Minus Control	0	+ 1.9

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[1] Application Rate = Applications for food stamps by elderly as percent of estimated elderly eligible for food stamps (Table 4.1 Columns 5 and 6 ÷ Column 2).

Unlike food stamps, the Medicaid program is estimated by local service providers to have a number of currently enrolled persons who do not utilize the benefits to which they are entitled. This occurs because enrollment in Medicaid is automatic for all recipients of Supplemental Security Income or General Assistance. It was a further goal of this programming to increase the use of Medicaid by those already enrolled. Unfortunately, the State of Pennsylvania does not record data on Medicaid claims in a manner which permitted distinct tracking of the use of Medicaid by persons in each of the experimental and control groups. Data were tracked on the rates at which persons in each of these groups applied for enrollment in Medicaid. Table 4.3 lists these data along with the estimated proportion of eligibles in each group and Table 4.4 compares the matched experimental and control groups.

Two experimental groups had higher sign-up rates than their controls before the experiment (Horizon and Kennedy). Only one of these increased (Horizon); the other decreased during the experiment. Of the other two experimental groups only Neighborhood 17 West showed an average two-month sign-up rate during the experimental period which exceeded that of its control. The changes in the sign-up rate differentials during the experimental period are therefore positive for only two experimental groups and they are both quite small.

Finally, it should be noted that very little programming was done over the NCC system on this topic. Medicaid outreach was subsumed under 'other services of the County Board of Public Assistance.'

Table 4.3

Eligibility and Applications For Medicaid From
Elderly by Experimental and Control Groups:
Nov/Dec 1975 and Jan 1976/Feb 1977

I. ELIGIBILITY FOR MEDICAID	Elderly Population 60 +	Estimated Eligible For Medicaid	Eligibles As Percent Elderly	Percent Elderly Contact With NCC System[1]
	#	#	%	%
A. Experimental				
Horizon NCC	1,341	335	25	32
Kennedy NCC	139	29	21	53
Hensler NCC	102	22	22	32
Home Viewers[2]	238	14	6	32
B. Control				
Downtown Reading[3]	17,290	3,458	20	n.a.
Franklin	50	6	13	11
Oakbrook	125	29	23	4
Home Viewers[2]	508	122	24	0

II. APPLICATIONS FOR MEDICAID	Applications by Elderly		Applications As Percent Eligibles
	Nov/Dec 1975	Jan 1976/ Feb 1977	Jan 1976/Feb 1977
	#	#	%
A. Experimental			
Horizon NCC	4	63	19
Kennedy NCC	2	10	34
Hensler NCC	0	8	36
Home Viewers[2]	0	8	57
B. Control			
Downtown Reading[3]	119	655	19
Franklin	0	6	100
Oakbrook	0	25	86
Home Viewers[2]	1	2	2

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[1] Data derived from survey questionnaire.

[2] Reading's Planning Neighborhood 17 was divided East and West. Converters were installed in West for the experiment; East was the control group.

[3] The rest of Downtown Reading excluding the experimental and other control groups.

Table 4.4

Comparison of Application Rates For Medicaid by Control and Experimental Groups Before and During Experiment

	APPLICATION RATES[1]	
	Nov/Dec 1975	2 Month Average Jan 1976 to Feb 1977
	%	%
I. DISPERSED RESIDENTIAL AREA		
Experimental: Horizon NCC	1.2	2.7
Control: Neighborhood 17 East	.8	.2
Experimental Minus Control	+ .4	+ 2.5
II. RESIDENTIAL TOWERS		
Experimental: Kennedy NCC	6.9	5.3
Control: Franklin	0	14.3
Experimental Minus Control	+ 6.9	- 9.0
III. GARDEN APARTMENTS		
Experimental: Hensler NCC	0	5.2
Control: Oakbrook	0	12.3
Experimental Minus Control	0	- 7.1
IV. HOME VIEWERS WITH CONVERTERS		
Experimental: Neighborhood 17 West	0	8.1
Control: Neighborhood 17 East	.8	.3
Experimental Minus Control	- .8	+ 7.8

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[1] Application Rate = Applications for Medicaid by elderly as percent of estimated elderly eligible for food stamps. (See Table 4.3.)

In fact, only about one third of the 4.75 hours of the programming total for this category (or 1.6 hours) dealt directly with Medicaid. This, plus the low proportion of the experimental groups having contact with the system, makes it unlikely that pronounced changes in the uptake of Medicaid would occur as a result of this programming.

Direct Banking Option

The Direct Banking Option was introduced in Pennsylvania in October 1975. It is a new feature of the Social Security program under which recipients of any Social Security benefits can have their monthly checks mailed directly to their bank rather than to their home. Social Security is encouraging enrollees to sign up for this option in the hope that it will reduce the incidence of lost and stolen checks. The NCC system was used to promote the Direct Banking Option with spot announcements and outreach programming. Elderly system participants were given information on how the option works, how to sign up for it, and its advantages.

The goal of this programming was to increase the uptake of the option by elderly Social Security recipients. During the one-year period of the experiment, there were other kinds of outreach for the Direct Banking Option, such as federally-sponsored advertisements on TV, radio, and newspapers, to which all Reading residents were exposed. This is unlike the case with food stamps and Medicaid for which there was little if any outreach being done by sources other than the NCC system during the year. The data on uptake of the banking option by the eight groups are presented in Table 4.5 and reflect the combined effects of NCC outreach and the other outreach for the experimental groups as compared with the effects of the other outreach only for the control groups.

The figures on Table 4.5 show the number of people aged 60 and over who signed up for the Direct Banking Option at the Social Security Office in Reading. It was also possible to sign up directly at a bank. Social Security estimates that the majority of persons sign up at Social Security. Unfortunately, because of the large number of banks in the Reading area and the complexity of collecting data distinctly for each of these eight groups, it was not possible to track bank sign-ups. This will not bias the results here unless different proportions of the eight groups tended to sign up at a bank rather than at the Social Security Office.

Table 4.6 contains the comparisons in sign-up rates between the matched control and experimental groups. In November/December 1975, all four experimental groups had higher sign-up rates than their controls. During the 14 months of operations, one group, Hensler, displayed a lower rate than its control. The other three experimental groups increased their lead over their matched control. The sign-up rate for the city as a whole, excluding these 7 groups (the rate for Downtown Reading), declined during this 14-month period. It also fell for each of the control groups, but considerably less for experimental groups; indeed, in Kennedy the sign-up rate increased.

Table 4.5

Social Security Recipients Who Signed Up For Direct Banking Option by Experimental and Control Groups: Oct/Dec 1975 and Jan 1976/Feb 1977

I. SOCIAL SECURITY RECIPIENTS AND SIGN-UPS FOR DIRECT BANKING OPTION	Social Security Recipients	DIRECT BANKING OPTION SIGN-UPS	
		Oct/Dec 1975	Jan 1976/Feb 1977
A. Experimental			
Horizon NCC	1,247	91	64
Kennedy NCC	135	5	8
Hensler NCC	100	3	2
Home Viewers[1]	220	20	18
B. Control			
Downtown Reading[2]	16,404	853	596
Franklin	50	1	0
Oakbrook	120	3	3
Home Viewers[1]	475	29	13

II. SIGN-UPS AS A PERCENT SOCIAL SECURITY RECIPIENTS	Oct/Dec 1975	Jan 1976/Feb 1977[3]
	%	%
A. Experimental		
Horizon NCC	7.3	5.6
Kennedy NCC	3.7	6.2
Hensler NCC	3.0	2.1
Home Viewers[1]	9.1	9.0
B. Control		
Downtown Reading[2]	5.2	0
Franklin	2.0	2.6
Oakbrook	2.5	2.9
Home Viewers[1]	6.1	3.8

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[1] Reading's Planning Neighborhood 17 was divided East and West. Converters were installed in West for the experiment; East was the control group.

[2] The rest of downtown Reading excluding the experimental and other control groups.

[3] Sign-ups Jan 1976 to Feb 1977 as a percent of Social Security recipients not already signed up by December 1975.

Table 4.6

Comparison of Sign-Up Rates For Direct Banking Option by Control and Experimental Groups Before and During Experiment

	SIGN-UP RATES[1]	
	Oct/Dec 1975	Jan 1976/Feb 1977
	%	%
I. DISPERSED RESIDENTIAL AREA		
Experimental: Horizon NCC	7.3	5.6
Control: Neighborhood 17 East	6.1	2.9
Experimental Minus Control	+ 1.2	+ 2.7
II. RESIDENTIAL TOWERS		
Experimental: Kennedy NCC	3.7	6.2
Control: Franklin	2.0	0
Experimental Minus Control	+ 1.7	+ 6.2
III. GARDEN APARTMENTS		
Experimental: Hensler NCC	3.0	2.1
Control: Oakbrook	2.5	2.6
Experimental Minus Control	+ 1.5	- .5
IV. HOME VIEWERS WITH CONVERTER		
Experimental: Neighborhood 17 West	9.1	9.0
Control: Neighborhood 17 East	6.1	2.9
Experimental Minus Control	+ 3.0	+ 6.1

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[1] For sign-up rates see Table 4.5.

Summary of Uptake Findings

The general conclusion from these uptake findings is that there is no evidence of a significant and consistent impact by the interactive programming. For food stamps and the banking option there is some indication that two of the experimental groups (Horizon and Neighborhood 17 East) produced a higher rate of uptake than their matched control groups; however, in some cases this superiority existed before the experimental period as well. There is no consistent relationship between the amount of contact a group had with the NCC system and the change in its uptake rate.

Several points should be mentioned here. First, the uptake data for all of these services were tracked for fairly large groups by geographic area, including an estimated total of 2,503 persons aged 60 and over. Both eligibility estimates and attendance estimates are drawn from a much smaller survey sample of 707 persons. While the eligibility estimates should be quite reliable because the areas were fairly homogeneous in terms of eligibility criteria, the attendance estimates may overestimate the true amount of contact each of these larger groups had with the NCC system. Even if they are accurate, the probability of even a moderate proportion of the eligible people in any of these groups having contact with the specific outreach programming on food stamps, Medicaid, or the banking option is quite low. The two most important reasons are: (1) that of those who had contact with the NCC system, most did not have frequent contact; and (2) that the specific outreach programming on the topics was not frequent.

CHAPTER 5

SUMMARY OF MAJOR FINDINGS AND RECOMMENDATIONS

The major findings from the economic evaluation of the output of the system are summarized in this chapter. First, the specific findings on the Reading costs are presented as follows: (1) average costs per hour of interactive programming; (2) average costs per participant hour; and (3) uptake of specific services. Second, the system as it evolved in Reading is evaluated more qualitatively, particularly from the service-delivery perspective. Finally, recommendations based on the implications of this study are made for future uses of two-way interactive systems and further research.

Major Findings

Average Costs per Hour of Interactive Programming

After presenting the average cost per hour for all programming, the differences between the social service categories are summarized. Then, the decline in hourly costs during the year are shown and man-hours for preparation and presentation are described. In conclusion, a brief explanation of the costs included in these findings is given and interpretations of their meaning are discussed.

Cost of interactive programming. The average cost per hour of interactive programming in Reading was $326. Overhead costs were estimated to be $160 per hour; of the remainder, NCC staff cost $103 per hour, agency staff $28 and elderly volunteers $36. Controlling for variations by social service category and the decline during the year, the minimum cost per hour without overhead came to $100.

Variations in cost by social service category. The average cost per hour varied considerably by social service category and ranged from a low of $308 for recreation to a high of $435 for outreach for public assistance programming. In general, the more expensive services were those which used more agency staff time in their preparation and presentation. In particular, programming for services which were complex required more preparation by agency staff. The most expensive topics were outreach for food stamps, for other public assistance, and for housing, legal, and transportation services.

The cheaper services were those which needed less agency staff and which the elderly staff and volunteers could produce. In addition, topics were also cheaper the more often they were produced since efficiency was increased with experience; programs which were produced on a regular basis needed the least preparation. The cheapest service topics were recreation and other education. Interaction with service suppliers had higher average costs because the mobile unit was used which was operated by NCC staff, but the costs fell considerably during the year as experience was gained by all participants. Controlling for the decline in costs during the year, topics fell into one of two categories; one group had costs per hour around the minimum of $100, the other incurred extra costs for preparation and presentation. In addition to the outreach topics, all the form filling topics and health education were more expensive, ranging from $50 to $80 per hour above the minimum. All other topics were about the same; only outreach for Horizon Center was significantly lower.

Decline in average hourly costs during the year. Average hourly costs declined significantly during the year and conclusive evidence was found of a strong learning curve effect. Controlling for the variation in costs by social service topic, it was found that the average manpower cost of producing one hour of programming (excluding overhead) fell from $120 to $80 during the year. Assuming that the learning curve effect lasts for the first year of operations only, this suggests the usual operating cost of manpower is $80 an hour. Separate estimates of overhead costs were made for the initial year and regular operations. Overhead was estimated to be $120 per hour for regular operations, which would make the minimum cost of an hour's programming $200 after the first year with extra costs for more complex, irregular, and new programming.

The gains in efficiency were manifested in the following findings:

1. Time inputs of the three main groups--NCC staff, agency staff, and the elderly--fell significantly.
2. Training of the elderly was completed.
3. Both elderly staff members and volunteers increased their share of the programming inputs.
4. The elderly were better able to substitute for agency and NCC staff in those services which were less complex in terms of rules and regulations.

Manhours for interactive programming. Estimates of the average manhours per segment were made separately for preparation and presentation for the three main staffing groups, NCC, agency, and elderly. The average length of a segment was .64 hours and fell during the year. The average manhours per segment were 6 1/2, of which 4 1/2 were spent on preparation and 2 on presentation. The three staffing groups shared in all the tasks and contributed roughly one-third each. The total manhours per segment fell from 9 hours in the first quarter to just over 5 hours in the last quarter. Average manhours spent in presentation fell slightly from 2.2 to 1.8 hours as the segments grew shorter. The main saving was in the time input to preparation which fell from 6.8 to 3.4 hours. The elderly took an increasing share of both preparation and presentation, but took over more in presentation.

Conclusion. The average costs per hour presented above include the manpower costs of all NCC staff plus the estimated value of the contributions of the elderly volunteers. Estimates of the actual overhead costs of operating the system are made, but these do not include the cost of downstream cable or of space rental, because they are not currently incurred as expenses in Reading. These cost estimates most closely approximate the economist's conception of opportunity cost--that is, the summation of the cost of all economic resources employed in the production of the interactive programming. Overhead costs, and consequently, the full economic cost, would be higher than the figures presented if the value of the downstream cable and space were added. It was decided not to estimate these costs because there was no basis for choosing the appropriate price.

In short, the costs presented are higher than actual costs by the addition of agency staff and volunteer elderly but lower than full economic resource costs. In neither case do these costs represent the appropriate price to charge for producing interactive programming, since they reflect average costs of all programming over a period of time. The costs of producing a specific program or series of programs might be higher, even though agency staff and volunteers would not have to be paid, because it takes more time than the average to develop new programming from scratch. It is also not at all clear what share of overhead should be charged to purchasers of specific programming, particularly if the programming is viewed as a service to the elderly.

In conclusion, it is clear that the average cost per hour of interactive programming is drastically lower than one-way television production for similar public service programs. The main reason is that the interaction itself is the "program" which occurs spontaneously without a script or elaborate preparation and rehearsal. Because production is not technically complicated, it can be handled by non-professionals and encourages considerable volunteer input which keeps production costs very low. Since the system can be run by a very small number of full-time staff, the overhead costs are reduced dramatically.

Average Costs per Participant Hour of Interactive Programming

Average costs per participant hour (average cost per hour divided by average participants per hour) were calculated as an estimate of the costs of delivering services over the interactive system. The cost of delivering services interactively is directly related to the number of participants at the NCCs and the number of viewers who watch the programming at home or elsewhere. In Reading, the interactive services were available in three centers and for homes which could receive the interactive programming one-way. For the first nine months of operations, 117 homes were supplied with a converter which enabled them to view the daily transmissions; for the last five months, all 35,000 subscribers to ATC-Berks Cable TV Co. could watch. Therefore, it was possible to trace the effect of extending the interactive system to a wider audience on the average costs per participant hour. In addition, the average cost per participant hour was estimated for different social service topics and descriptive comparisons with other ways of delivering the same service were made. However, since the data on home-viewer preferences were not as specific as the information on NCC attendance for each topic, the effects of increasing scale on costs by social service are less reliable.

The effect of expanding the audience on average costs per participant hour. The average social service cost of an hour of interactive programming was about $300, of which $160 was for overhead, $108 for NCC staff and $32 for agency staff.[10] The value of volunteer time was excluded so that the interactive costs could be compared with the costs of delivering similar services in other ways.

The system reached an average of 52 elderly people in the NCCs for an average cost of $5.76 per participant hour. The addition of home viewers with converters during the first nine months reduced average costs per participant hour to $3.65. Each converter added .33 viewers per hour, or 38 viewers out of 117 homes, but cost at least $ .20 per hour. In other words, each added viewer cost $ .61 per hour.

The extension of the interactive programming to 35,000 cable subscribers in the last five months yielded an additional 876 viewers or

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[10] These averages are slightly higher than those presented earlier because they are weighted by social service category and not by hours of programming.

7.3 viewers per hour for every 100 homes with an elderly inhabitant. Since the addition was costless it reduced average participant costs per hour from $5.76 to $ .32.

Finally, using the findings from the Reading experience, it was estimated that roughly 75,000 subscribers are needed to reduce average costs per participant hour to 13 cents or the cost of first class mail. This estimate would be lower if more viewers per hour could be encouraged by advertising the programming, which was not done in Reading. However, it would be higher for communities with a lower percentage of elderly living in homes subscribing to cable.

Average costs per participant hour by social service topic. Average costs per participant hour ranged from $2.15 to $6.33 in NCC costs (NCC staff plus overhead) and from $ .04 to $1.79 for agency staff. Total costs varied from $2.47 to $7.25.

The four topics with high average attendance (107 to 127 per hour) had the lowest average costs per participant hour, around $2.50. These were: recreation; interaction with local and state government; interaction with social security; and outreach for other services. All form filling and education topics had low average attendance (43 to 59 per hour) which meant high average costs per participant hour for these topics; the two highest were rent rebate form filling and health education at more than $7 per hour. The remaining outreach topics varied from $3.50 to $5 per hour; those which required that more specific information be explained cost more, but attendance was higher than for form filling.

No direct comparisons could be made between these costs and the costs of delivering the same services non-interactively. However, it was concluded that three categories, outreach, interaction with service suppliers, and recreation, were provided at a lower cost than would be possible at one central location taking into account the cost of transporting the elderly. In addition, the interactive nature of the system provided an additional benefit both in its positive effects on the elderly themselves and in the immediate feedback provided to the service suppliers. The more expensive categories, form filling and education, which drew relatively few participants to the NCCs, would presumably have the same, or a worse, problem at a central site. Because of the wider dispersion of NCCs, it is clear that so long as the NCC system attracts as many as a central location, it will cost less in transportation costs.

The extension of interactive programming to those in their homes reduces all social service costs dramatically, although the rate of reduction may vary between services if home viewers have significantly different viewing preferences among social service programs when compared with NCC participants. Small surveys of cable subscribers seemed to indicate that preferences were similar, with the possible exception of education which may be more popular at home than in the centers. However, the questions on the survey were fairly imprecise and do not constitute reliable estimates of preferences. The nature of the service delivered and its effectiveness may also be quite different for NCC attenders and home viewers. Research at Reading throws little quantitative light on these issues, but they will be discussed qualitatively in the following section.

Uptake of Specific Services

Research was designed to compare the uptake of three specific services (Food Stamps, Medicaid and the Direct Banking Option for Social Security recipients) between experimental groups with access to the NCC system and control groups with no access. The four experimental areas included two public housing projects for the elderly which housed NCCs, the residential neighborhood surrounding Horizon Center (the senior citizens' center which had the third NCC) and Neighborhood 17 West, the area in which homes were provided with converters to receive the interactive programming one-way.

For food stamps and the banking option, there was evidence that residents near Horizon Center and the home viewers had a higher uptake than their control groups. In all other cases, there was no clear evidence of any effect; indeed in some cases control groups improved their position relative to experimental groups. However, there was evidence that the interactive system had begun to have an effect on awareness of the services, particularly food stamps and Medicaid.

It was concluded that this research did not provide a fair test of the effect of the interactive system on uptake of specific services. The two main reasons are, first, that the experimental period of one year was not long enough to test the impact of the system on service delivery, and, second, that insufficient programming was done on these specific services during the course of the year.

Evaluation of the Interactive System as a Means to Deliver Social Services

The interactive system is evaluated more qualitatively in this section to provide a background for the recommendations. The nature of the system as it has evolved in Reading, as well as its relevance to other situations is analyzed in the context of what is known and what is not known at this point. The findings of other reports on the Reading experiment are drawn upon but not necessarily quoted since the references are all given in the main text. The system is evaluated from three perspectives; (1) interactive systems for the elderly; (2) methods for expanding the scale of interactive systems; and (3) implications for service delivery by interactive systems.

Interactive Systems for the Elderly

It may be that the most important findings of the Reading experiment are that such a system was set up, that it achieved its main goals of involving the elderly participants in production and operation, and that it continues to flourish. It is also clear that the initial investment costs of $235,000 and annual operating costs of $110,000 are not exorbitant. The fact that existing agencies are subsidizing the system directly and indirectly would indicate that interactive programming is accepted as a viable way to deliver services to the elderly in Reading. In addition, although many of the survey results are inconclusive, participation in the interactive system has had some positive effects on the elderly, particularly in their attendance at various activities for senior citizens, their familiarity with and use of various local services and their self image. Furthermore, many of the elderly felt that services had improved for them in Reading, and specifically identified the NCC system as one example. In this sense, the experiment proved that an interactive system can be set up which enables a target population to become involved in its running and to influence the delivery of services. The questions which remain are the extent to which this represents a unique situation and whether such systems can be developed for other groups in other situations.

To the extent that the elderly of Reading are not untypical of elderly in other places, it is reasonable to suggest that interactive systems for the elderly can also work in other places. It should, however, be noted that the elderly who participated in Reading were fairly homogeneous in regard to racial and ethnic characteristics; in particular there were no black communities connected to the system. It is possible that interaction between different ethnic or class communities might prove more difficult, and also potentially more rewarding when it does work.

It is less clear that interactive systems of the Reading character would work for other age groups. One critical component is the time available to retired people to devote to producing and running the system. Most other adults have full-time commitments to work at home or on jobs, and are not available on a daily basis and, although young people might be enthusiastic participants, it is difficult to imagine that they could assume the responsibilities of managing a substantial service delivery system on a daily basis. A system which had to depend on professionals to a great extent would be a very different kind of system, as well as more expensive.

Non-working wives are perhaps the most likely candidates for significant involvement in interactive systems. It might be possible to develop programming by and for housebound women, as well as by and for the elderly. This could be a useful addition to already existing neighborhood information and service centers in larger urban areas. Finally, there are also substantial pools of available participants in poor neighborhoods where the unemployment rates are high. Although there might be a high turnover rate among such volunteers, it would certainly be an interesting experiment to see whether the interactive system could be adapted to provide the necessary services for these neighborhoods and to reduce the high unemployment rates of ghetto youth in large urban areas. All such possibilities await future experiments, but suggest themselves from the nature of the Reading system.

Methods for Expanding the Scale of Interactive Systems

It has been clearly demonstrated that the most important way to reduce the average costs per participant hour of an interactive system is to expand its scale. This can basically be done in one of two ways: (1) by increasing the participants in the system; or (2) by expanding the amount of programming to reduce the overhead costs. Some of the methods involve additional costs themselves, but may still be worthwhile. It will be useful to evaluate what has been learned and what is still unknown about increasing the scale of interactive systems.

When interactive programming can be transmitted one-way to cable subscribers at no additional cost, average costs per participant hour can be reduced dramatically. However, this method is not without disadvantages. Apart from differences between the experiences of participating in a center and viewing at home which are discussed more fully in the next section, there are problems of equity in the distribution of services to cable subscribers alone. Since a cable subscription costs money, low-income citizens are least likely to subscribe, yet are the most in need of services. Therefore, the characteristics of the subscribing population are critical for knowing whether such an expansion is reaching the target population in terms of service delivery. If the only way to connect target participants is to pay their subscription, such expansions are not costless. This does not mean that such expenditures are not economically worthwhile, for they would be until the additional cost does not bring enough additional viewers for average costs to continue to fall. However, the cost of reaching a significant number of the non-subscribing target population might raise the budget for investment and operating costs above political feasibility. At this point, we do not know enough about these kinds of expansions to draw any conclusions about appropriate scale.

Another way to increase the audience might be to increase the number of centers. The investment cost per center was roughly $28,000, and early operating costs were $2,000 per month, per center, falling to $1,200 per month after the implementation staff left. It is not always easy to know, however, whether a new center will draw a sufficient audience to reduce average costs; often it takes time to build an active group at an NCC. There is also a limit to the total number of centers for both technical and practical reasons. Technically, the switching capacity may be limited and, practically, too many interaction centers may create queueing problems in the conduct of a given program and management problems in the planning of programming and operation of the system. Although we cannot know since it has not been done, it would seem that about four is the practical maximum number of permanent sites to maintain the current character of the system; many more centers would require more complex management and therefore, different skills of participants. Mobile units, however, will always be a method for broadening the audience by interconnecting others.

In short, since there are costs and limits to the possibilities of expanding the system by adding centers, the major way to reduce average costs by expanding the audience is the one-way extension to home viewers. This possibility depends upon the availability of downstream channels. The more home viewers are increased relative to the centers and, therefore, actively involved, the more important it is to know whether there are significant differences in the needs and interest of the two groups.

The other way to reduce overhead costs is to use the existing system more intensively. Thus, hours of origination can be increased, the number of services delivered can be increased, and the number of target groups participating can be widened. The first two have occurred in Reading, and their effects on average costs are therefore reflected in the results reported. Since the formal end of the experiment, however, some evening programming has been started and other means to increase the use of the system have been explored. Repeats of morning programs at night are an almost costless way to increase the audience of particular programs and therefore lower the average cost per participant hour.

An enormous number of programming ideas have been tried at Reading, so that it is less likely that the range of services will be widened. However, it is the view of some, and the research findings support the idea, that considerably more programming could be done on some specific services. In particular, follow-through in programming and experimentation with different modes of delivery would be the most likely source for improved effectiveness of individual services, and consequently for the increased impact of the system as a whole. Nothing has yet been learned about developing an interactive system for more target groups than the elderly, because such an effort was only recently started in Reading. Although there may be apparent cost advantages to having a broader group of users, there may be qualitative losses in the sense of identification and organizing thrust. Since it is critically important for the success of a user-operated system that the users are in control, it may be important that they be a reasonably homogeneous group. For instance, one can imagine that a great deal of the momentum of an operating senior citizens' system would be lost if it were redirected to include too many other groups too quickly. It might be possible to develop another group to use the same system if there were clearly identified hours and types of programming; whether one could find groups for whom the use of senior citizen centers would be appropriate is another matter. However, starting an interactive system from scratch building on existing multi-group centers might be quite feasible. For instance, where there are existing neighborhood centers, there would be a diversified group who are already providing different services in the same space. This seems the best candidate for future experimentation with interactive systems for wider groups.

Implications for Service Delivery by Interactive Systems

It is clear that the interactive system provides a wide variety of services in many different ways. While it makes it difficult to draw specific conclusions about service delivery from the Reading experience, it is undoubtedly the natural concomitant of a new experience and an important ingredient for development and growth. The short time of operation and the programming priorities in Reading mean that the research findings on service delivery effectiveness are inconclusive. This section, therefore, gives a more qualitative and, perforce, a more tentative evaluation of the implications of the Reading experience for service delivery questions and future research.

The Reading system is a hybrid delivery system, both in terms of participants and services. The target participants consist of at least two distinct groups with different kinds of involvement; that is the NCC attenders and the home viewers. In fact, the NCC attenders can also be divided into involved participants, the elderly volunteers and staff, and the audience who are less active and/or less regular participants. The service deliverers are a diverse group with different interests as well. Not only are there public and private service agencies, but it also turned out there were distinct differences between the needs and interests of elected officials and of agency administrators and staff. These differences were reflected in different perceptions and uses of the service potential of the interactive system. Consequently, there is no simple model of interactive service delivery in terms of service users and service suppliers, even without the complications of the different kind of services themselves. It will be helpful to look at the service users first and then to discuss the services under five broad categories: (1) interactive services which are a service in themselves; (2) interactive services which are substitutes for other delivery systems; (3) interactive services which are complements to other delivery systems; (4) services for which interactive systems are not an appropriate delivery mechanism; and (5) process.

Service users. The critical difference in service users for delivery systems is between NCC attenders and home viewers. Both are important components of the system, the attenders because they are the heart of the system, the home viewers because, currently, the expansion of the system represents, to them, the most practical way to reduce average costs and to make interactive systems economically feasible. Yet, there may be significant differences between the needs and interests of the two groups from a service delivery perspective. The research in Reading throws little light on these questions; the initial surveys of cable subscribers are not reliable and the survey of converter users was not primarily designed for this purpose. Therefore, no conclusions for service delivery can be drawn at this stage, although the implications will be expanded upon.

It is particularly important in the development of a system where the participants determine the programming output, that the interests of all the target population are reflected in these decisions. Since the extension to cable subscribers in Reading was not anticipated when the research was designed, little information is available on the characteristics and preferences of home viewers to compare with NCC attenders. It is important to find out what, if any, differences there are in order to assess the relevance of programming to viewer interests and service needs. A much smaller group is likely to be interested in active involvement and the responsibilities of operating the system than the much wider audience both at the centers and at home which is necessary to reduce average costs. Therefore, if one purpose of the programming is to serve the needs of the wider group, then it is important to find out the extent to which the active group reflects their interests and needs in the program planning.

In general, the more specific the content of programming, the more necessary it is to know whether the programming is reaching the target population. For instance, in health education, one can assume that most people can use nutritional guidance since everyone eats, but if one wants to help sufferers from Hodgkin's disease, it is important to know how many sufferers there are in the viewing population to decide if it is worth doing the programming.

In conclusion, it is possible that real conflicts of interest from the service perspective, may evolve between the organizers of the programming and the target viewers at home. If it is true that home viewers, for instance, like to view educational programming more than NCC attenders like to attend such sessions, then the wrong conclusions about the effectiveness of the system in delivering educational programming will be drawn from looking at attendance figures. Moreover, the programming is likely to contain fewer educational hours than would be appropriate for the system as a whole. It is possible that service deliverers can help to correct the bias, but of course they have their own biases in terms of their perceptions of service needs. In short, more information is critical for sensible choices.

The Characteristics of Interactive Services

(1) Interactive services as a service in themselves. Much of the interactive programming provides a direct service, but it is not clear that the interaction is a service in itself. For instance, all the recreational programming provided a direct service but it is not clear whether providing it over an interactive system makes it an interactive service per se. Singalongs, for example, can be organized by other groups, which provide untelevised interaction for participants. These singalongs may not attract as many participants as the interactive system, but it may be because they are more difficult to reach, rather than that the interactive singalong has some additional component. At this point, in most cases we really do not know what the uniqueness of the telecommunicative interaction may be as a service in itself. It is possible, however, to isolate situations in which the interactive nature of the service delivery makes a difference to the service. The clearest examples are the interaction with service supplier, when the interactive system enabled the service users to intervene in the process of delivery, to make demands of the service suppliers and to modify the nature of the service delivered. Some evidence was also found that the interactive system encouraged the elderly to come to the NCCs to interact and to socialize, which may be valuable in itself. There was further evidence that the system encouraged the elderly to avail themselves of local services, such as congregate meals, to participate in neighborhood senior citizens'

activities and to come to Horizon Center for its activities.

(2) Interactive services as a substitute service. The usual economic criterion for adopting one kind of delivery system instead of another, is that it is cheaper. The research tried to identify those services for which the interactive delivery had the lowest cost. It was found that much of the programming did provide services more inexpensively, in particular, recreation and meeting with service suppliers. These services were cheaper because it costs less to gather people at dispersed locations, such as NCCs, than to gather them in one central location. In addition, the access to the home-viewing audience, both reached more people than meetings usually gather and could be done at low or zero marginal cost. Thus, for instance, the dissemination of general information was cheaper than phoning or mailing, although the receipt of information cannot be guaranteed for specific individuals. There was some evidence that home viewers received more information than NCC attenders, which makes sense since they watched more often than NCC participants attended except for the committed volunteers and staff. Furthermore, from the small audience survey it appeared that home viewers liked educational programming more than NCC attenders, which might make this kind of service more efficient to deliver interactively, assuming the same amount of learning took place, than appeared to be the case from our research. Interestingly, there was also some evidence that home viewers with a converter had a higher rate of joining non-interactive education series at Horizon Center.

(4) Interactive services as complementary to existing services. Since the usual basis for comparison of delivery systems is when they are

substitutes for each other, the research did not focus on studying those services where the interactive programming might be an important complement to existing delivery. However, the research on outreach was designed to look at the uptake of the service in the agencies. Therefore, some clues about the possible effectiveness of interactive systems as complements to existing services could be gathered. But basically, we did not explore the full potential of the interactive system in this regard.

In particular, little experimentation was done to find other ways to deliver the services. For instance, although it had originally been proposed to sell food stamps at NCCs, this, in fact, was not tried. Similarly, form filling might have been more effective if professional help had been provided at centers during and after the sessions; that is, more people might have been encouraged to attend the sessions and to fill out their forms without recourse to agency staff in their offices. Instead, when many senior citizens, who were used to having an agency staff member fill out their rent rebate forms, still wanted that personal help, the staff member both presented a session and visited individual centers. In general, the period was much too short to develop different experiments with complementary service delivery, and, unfortunately, little programming effort was devoted to such specific services. However, the Reading system now provides an ideal testing ground, not only for carefully designed experiments in interactive services, but also as a way to try out any new service delivery ideas.

(4) Services for which interactive systems are not an appropriate delivery mechanism. It was always assumed that the interactive system would never substitute for the provision of individual counselling and advice on personal matters. Therefore, the provision of such services over the interactive system was never contemplated. Interestingly, form filling proved one of the less popular services and it might reasonably be assumed that this was due to the personal information involved. However, it also turned out that many quite popular programs covered very personal issues, such as appearance, sex, and death. Thus, discussions of personal subjects when one is free to participate or not, and can choose whether to ask for individual advice, appear to be suitable for interactive delivery. As complements to personal counselling by showing how others deal with similar problems and where help can be found, such services may be much more effective than individualized counselling on its own.

(5) Process. The most important and least clearly defined service characteristic which the interactive system affects is the process of service delivery. The critical difference between interactive and non-interactive delivery is the immediate feedback which service deliverers receive from the service users. In a complex bureaucratic society the development of processes which enable service users to talk back to officials and administrators, as well as to their TV, may help to redress the balance in favor of citizens and service recipients. It also provides a fruitful setting for experimenting with service delivery ideas of all kinds. Some research was done in Reading on the effects of the interactive system on officials and personnel who used the system, but more is needed

to identify the critical issues from the service delivery perspective. It was concluded that elected officials viewed the experience (more positively) as a way to keep in touch with their constituents and respond to their demands, while administrators focused more on their own ability to give out information.

In conclusion, it should be emphasized that the cost effectiveness of the system should be seen in the way the system functions as a whole. It is its ability to provide a wide variety of different services in many different ways which is the true measure of its capacity, and therefore, ultimately of its effectiveness; it is not simply its ability to provide specific services more cost effectively than others. Even so, specific services can be delivered very cheaply when the interactive programming is available one-way to existing cable subscribers. The complexity of this service system makes precise evaluation difficult and increases the importance of obtaining the relevant information for decisions about the appropriate services for interactive delivery.

Recommendations

Two kinds of recommendation are made, those for the development of two-way interactive service systems and those for future research.

Recommendations for the Development of Two-way Interactive Services

(1) We strongly recommend the continued requirement that cable companies provide two-way capability in their systems. Although there have not been many applications in the past, the experience in Reading indicated that there is a rich potential for the development of interactive systems. Furthermore, where one-way viewing can also be provided

to current subscribers, the average costs of service programming can be reduced to levels competitive with alternative delivery methods.

(2) We further recommend that local communities and the Federal Communications Commission require the provision of a community channel which is free for public service programming. The service potential of the cable system when citizens are directly involved in producing the services for themselves has been amply demonstrated in Reading. The availability of downstream channel time without charge was one component of the low average costs of programming in Reading. Where there is excess capacity in the number of channels and/or the extension to public uses encourages more subscribers (of which there was some evidence in Reading), the cable companies have little to lose and much to gain by providing the channel time free. It is also possible that new profit-making uses will evolve from these public applications.

(3) We recommend investment in interactive systems for the elderly. Although there is much yet to discover about the ways such systems can be used most effectively, the Reading experience proved that it can be done and that it is not expensive.

(4) We recommend experimentation with interactive systems for other groups, particularly in a large urban environment. We would suggest an existing neighborhood service structure as the most likely base for developing a user-controlled system. Women, particularly wives and mothers who are not working full-time, are both the most likely source of part-time staff and volunteers to be trained for operating the system and the most likely to need community services. Other candidates for future experimentation are ethnic groups in large cities. Indeed, the development of these

inexpensive citizen controlled systems would give minority groups useful experience and important leverage as part of Federal efforts to encourage minority ownership of radio and TV stations.

(5) We recommend consideration of investment in such user controlled systems by agencies who are responsible for the overall delivery of services to their users, such as the Office on Aging, neighborhood service centers and women's organizations. In addition, we recommend the development of further applications of interactive programming to specific services, particularly as a complement to existing service systems. Although the interactive system is competitive as a substitute for some services, its full potential as a delivery system is most likely to be realized as one component in many more. Furthermore, interactive programming itself provides a useful service to public officials and administrators by giving an opportunity for feedback on service needs and concerns. Finally, citizens have a unique way to intervene directly between elected officials and agency staff and administrators in the delivery of services.

Research Recommendations

(1) For future research, we have two specific recommendations for avoiding the pitfalls to research encountered in Reading: (a) a longer test period; and (b) more programming on specific services to be tested.

(a) We recommend at least two years of operations to test the impact of the system; one year is not enough. From the practical point of view, it took at least six months to establish normal operating procedures, to build the critical mass of participants, and to know what services appeared most appropriate to study. From the theoretical perspective, the introduction of a new communication system into an existing service and information structure is likely to take some time to reach its full effects. Not only does it take time for the system users to gain experience, but the impact on service uptake, for instance, would be expected to evolve slowly if there was resistance to programs which would need to be overcome to increase uptake.

(b) We recommend developing some mechanism to ensure a reasonable amount of programming on the specific services to be studied. This could be done by paying for a specific series of programming on the system and conducting the research independently or by contracting for the research as part of the service programming package. Certainly it was a mistake to tie implementation of a user-controlled system with specific service research which was designed before the system was operational. It complicated programming priorities, as well as adding to the burdens of implementers. However, it is important that the public service nature of the system be understood. There is a danger that an interactive system unconstrained by demands for service programming which is less popular with the initial participants and emerging operators will not get the best public use out of the system. The practical issue is basically one of timing: when a system is firmly established there is little to risk, and, possibly, much to gain by introducing experiments on the delivery of specific public services.

(2) We strongly recommend further research on the Reading system itself. Since it has already proved a viable operation, there is a unique opportunity for learning more about the development of the system and about the effectiveness of specific services. In this regard, we have the following suggestions: (a) the design and implementation of appropriate

cost benefit studies of some specific services which are delivered now; (b) the development of new kinds of service delivery mechanisms; and (c) the establishment of a new center in the black community. We particularly urge the study of the ways in which interactive services can be developed in conjunction with other delivery mechanisms and the study of the impact of the interaction on service deliverers and on the process of delivery. Finally, it is important, and now possible, to find out about the differences in the characteristics, program preferences and service needs of NCC participants and home viewers. The relationship between these distinct groups, which little is known about, is crucial for the future operations of user controlled interactive systems.

(3) We also recommend research in all experiments and demonstrations of interactive systems. We particularly urge the study of complementary service delivery and the expansion of interactive programming to home viewers, since these are the most practical ways to increase the service capacity and to lower average costs for all interactive systems. However, it should be noted that there still remains much work to be done on the appropriate methods for evaluating the effectiveness of interactive systems like Reading's. A traditional cost benefit analysis of the alternative ways to deliver the same specific service is a very narrow test which does not measure the true capacity of the system. Nor does it capture the process of service delivery through interaction which is the heart of such systems.

APPENDIX A

1. Formula for Estimating a Segment's Share of Joint Costs

The estimate of joint costs was derived from data on the time input by system staff and by the elderly in set-up, operation, and tear-down of audio and visual equipment, chairs, props and other equipment necessary for the presentation of the session in which the given segment was presented. Since these session support staff costs were usually joint costs shared by all segments presented together at a single session, the following procedure has been used:

(a) the full labor costs for support staff at each session were computed, and

(b) each segment presented during a session was assigned a share of these joint costs. This share for each segment is equal to its proportion of total session time.

Thus, the estimate for the share of joint costs attributed to a given segment can be described as follows:

$$C_i = \frac{D_i}{\sum_{j=1}^{n} D_j} \cdot C_k$$

where:

C_i = cost for session support staff assigned to segment i

C_k = total cost for session support staff for session k at which j segments were presented, including segment i

D_i = duration of segment i (in minutes)

$\sum D_j$ = total duration of all n segments presented at session k (including segment i)

2. Multiple Regression Model and Results

This test was performed in order to discover whether or not variations in the cost of producing interactive programs/segments could be explained by the duration of the segment, the month in which the segment was produced, and by the social service topic or function with which it dealt.

The estimating equation was:

$$C_i = a + b_1(D_i) + b_2(M_i) + b_3(T_1) + b_4(T_2) + b_5(T_3) + b_6(T_4) + b_7(T_5) + b_8(T_6) + b_9(T_7) + b_{10}(T_8) + b_{11}(T_9) + b_{12}(T_{10}) + b_{13}(T_{11})$$

where:

C_i = the total manpower cost of producing segment i

D_i = duration of segment i, that is the total number of minutes in which interactive segment i was presented (a control variable whose effect was expected to be positive)

M_i = month of the experimental year in which segment i was produced (this variable represents the effect of increasing efficiency in the production of segments generally over the course of the year; it was expected to have a negative effect)

T_1 = a dummy variable for social service topic Health Education

T_2 = dummy variable for social service topic Transportation - Legal - Housing Outreach

T_3 = dummy variable for topic outreach on services of Co. Bd. of Public Assistance

T_4 = dummy variable for topic outreach on Food Stamps

T_5 = dummy variable for topic Form Filling-Out

T_6 = dummy variable for topic Citizen/Government Interaction

T_7 = dummy variable for topic outreach on other services

T_8 = dummy variable for topic outreach on BCSCC

T_9 = dummy variable for topic Consumer Education

T_{10} = dummy variable for topic Social Security Interaction with Service Supplier

T_{11} = dummy variable for topic Education Mixed.

Each segment fell into one and only one topic category and thus each case had a positive value for only one dummy variable.

The excluded topic was Recreation/Social Interaction. For Recreation/Social Interaction segments the model collapses to:

$$C_i = a + b_1 (D_i) + b_2 (M_i)$$

and for all other segments (T_n) it collapses to:

$$C_i = a + b_1(D_i) + b_2(M_i) + b_n(T_n) \text{ since } T_n = 1$$

$$C_i = (a + b_n) + b_1(D_i) + b_2(M_i)$$

The results of the regression were as follows:

$R^2 = .48$

$F = 37.8$

Variable	Estimated Regression Coefficient	"t" Level of Sig.
a = 47.90		
Duration	$b_1 = + .678$	sig. at 99% level
Month	$b_2 = - 2.17$	sig. at 99% level
Health Education	$b_3 = + 26.28$	sig. at 99% level
Transportation-Legal-Housing Outreach	$b_4 = + 41.76$	sig. at 95% level

(...Continued)

Variable	Estimated Regression Coefficient	"t" Level of Sig.
Outreach on County Board of Public Assistance	$b_5 = +\ 29.22$	sig. at 95% level
Outreach on Food Stamps	$b_6 =\ 35.08$	sig. at 95% level
Form Filling-Out	$b_7 =\ 27.84$	not sig.
Citizen/Government Interaction	$b_8 = +\ 7.43$	not sig.
Outreach on Other Services	$b_9 = -\ 4.13$	not sig.
BCSCC Outreach	$b_{10} = -\ 10.21$	not sig.
Consumer Education	$b_{11} = -\ 2.19$	not sig.
Social Security Interaction	$b_{12} = -\ 2.12$	not sig.
Education Mixed	$b_{13} = -\ .76$	not sig.

Therefore, the regression model predicts the cost of producing a segment on Recreation-Social Interaction to be:

$$C = \$47.90 + \$\ .678\ (\text{Duration}) - \$2.17\ (\text{Month of production})$$

and for segments with other topics:

$$C_n = a + b_n + \$.678\ (D) - \$2.17\ (M)$$

where b_n = the estimated regression coefficient for the relevant dummy variable.

Thus, the cost of all segments will increase with duration and decline with month in which produced and the cost 'constants' for the various topics will be:

Recreation = $a = 47.90$

Health = $a + b_3 = 74.18$

Transportation $= a + b_4 = 89.66$

County Board of Public Assistance $= a + b_5 = 77.12$

Food Stamps $= a + b_6 = 82.98$

Forms $= a + b_7 = 75.74$

Citizen/Government $= a + b_8 = 55.33$

Other Services $= a + b_9 = 43.77$

BCSCC $= a + b_{10} = 37.69$

Consumer Education $= a + b_{11} = 45.71$

Social Security $= a + b_{12} = 45.78$

Education Mixed $= a + b_{13} = 47.14$

3. Estimates of Overhead Cost for Reading Interactive System

Using the estimates for monthly operating costs in Phase I and Phase II, two different estimates of overhead were made. The figures used can be found in Table 2.6 of the report on "Costs of Reading Interactive Cable System and Alternatives for Replication" in this volume. The higher estimate represents the early period of operation when the full complement of implementation staff are working and before the learning curve has taken effect. The lower estimate represents the costs when the staff has been reduced to normal operating strength and after the learning curve has reduced average costs. Following the technique described below, the earlier Phase estimate of overhead was $200 per hour, and the later $120. Since average costs were falling throughout the year in which the direct manpower costs of programming were calculated, an average of these two estimates seems appropriate, and therefore the figure of $160 was used.

a) Technique for estimating overhead cost:

The technique for estimating overhead involved five steps as follows:

Step 1: Total staff costs, including 10% for fringe, were taken from Table 2.6 (these were $11,770 per month for Phase I and $7,315 for Phase II).

Step 2: Total staff costs which were directly assignable to the production of specific programming was deducted from this total. (The assignable costs were derived from the manpower cost data developed in this chapter with 10% added for fringe benefits.)

Step 3: 25% was deducted from the remainder because it is estimated that approximately 25% was spent on social service output other than interactive programming; that is, in the training of elderly persons, production of spots, and other activities.

Step 4: Non-labor costs were then added as follows:

Equipment Maintenance	$391
Cable	$411
Space	$315
Miscellaneous	$775
	$1,892 per month

These figures can also be found in Table 2.6 and are discussed in the text.

Step 5: The final annual figure was then divided by 400, the approximate estimate of the number of hours of programming in 1976.

b) Calculations of overhead costs:

		Annual Estimates	
		Phase I	Phase II
		$	$
Step 1:	Total Staff Costs	131,250	87,780
Step 2:	Less Directly-Assignable Costs	- 53,848	- 53,848
		77,392	33,932
Step 3:	Less 25% Step 2	- 19,348	- 8,483
		58,044	25,449
Step 4:	Plus Non-Labor Costs	+ 22,604	+ 22,604
		80,648	48,053
Step 5:	Divide by 400	$ 200	$ 120

APPENDIX B

1. Derivation of Estimate of Average Number of Converter Home Viewers Per Hour

The analysis in this report is based on an estimate of 38 home viewers per hour of programming on the average. Each category of program was assigned an average number of home viewers per hour above or below this figure (38) depending on the relative popularity of that programming with NCC attendees. (See this appendix, section 2.) The viewers come from the 117 homes which were equipped with converters enabling them to view the NCC programming. Of the 117 homes originally given converters, nine homes gave them back before the conclusion of the experiment. Of the remaining 108 homes which kept their converters for the duration of the year, 83 were interviewed on the Wave II survey in September 1976 and they reported the following viewing frequencies:

How often did you watch the special programming for the elderly?	once a week or less	two to three times a week regularly	four to five times a week regularly	don't know, no answer
# of respondents	11	40	25	7

If it is assumed, to be conservative, that viewers watched one hour of programming on the average each 'time' they watched and that those who watched 'once a week or less' had an average viewing frequency of one time (one hour) per month (per 30 hours of system output) and that those who did not answer the question have an average viewing frequency of zero, the expected number of converter people watching an average hour of NCC programming can be computed, as follows:

$$11 \times \frac{(2.5)}{30} + 40 \times \frac{(2.5)}{7.5} + 25 \times \frac{(4.5)}{7.5}$$

where:

x = Number of persons

2.5 = Probability of watching an hour

This results in an estimate of 28.7 expected average viewers per hour out of the 83 persons surveyed. Applying this proportion to the 108 converter-equipped homes yields an average expected audience of 38 viewers per hour.

2. Preferences of Home Viewers

The data collected on the survey of converter viewers did not permit detailed estimates of the differential preferences of these viewers for each topic of program presented. Therefore, the assumption was made that the preferences of converter viewers resembled those of NCC attendees. Each category of social service function has an estimated number of converter viewers per hour which bears the same relationship to the mean number of converter viewers for all programming which the average number of NCC attendees for that category bears to the mean number of NCC attendees for all categories.

That is:

$$V_i = V \frac{n_i}{N}$$

where:

V_i = estimated number of hourly converter viewers for social service programming in category i

V = 38 (estimated mean number of converter viewers for an average hour of programming in any category)

n_i = recorded mean NCC attendance for social service programming in category i

N = 49.8 mean recorded attendance over all categories.

Each topic within a social service category of programming will be assigned the mean number of converter viewers for that category as a whole.

On the Wave II survey (September 1976), 80 of the converter-equipped households were questioned as to their viewing preferences. The survey did not include detailed questions about how often they watched each category of program, but only whether or not they had ever seen specific programs drawn from each category; for this reason it was not possible to develop a complete profile of their viewing preferences. Nevertheless, the results do indicate a strong similarity to the preferences of NCC attendees.

Category of Program	Percent of converter viewers who watched a program in this category	Average number of NCC attendees for this category
Outreach	85%	60
Interaction with Service Supplier	75%*	71
Form Filling-Out	30%	29
Education	77%	28
Recreation-Social Interaction	79%*	61

The programming in the two starred categories, interaction with service supplier and recreation-social interaction, was not as fully represented by the survey questions as programming in the other three categories. For this reason the survey results probably understate the percentages of converter viewers who have watched the programming in these two categories.

If this is so, then the rank order of the five categories would be approximately the same for converter viewers and for NCC attendees with the exception of one category, education. This programming appears to be clearly more popular with converter viewers than it was with NCC attendees.

Category of Program	Percent of converter viewers who watched a program in this category adjusted for % of this category's programming represented by survey questions	Average number of NCC attendees
Interaction with Service Supplier	90%	71
Recreation-Social Interaction	87%	61
Outreach	85%	60
Education	77%	28
Form Filling-Out	30%	29

3. Surveys of Cable Subscribers

Beginning in October 1976, ten months after the start of the experiment, the interactive programming was made available to all regular subscribers to the ATC-Berks Cable TV Co. system over Channel 3. A mail survey questionnaire was sent out the next month (in November 1976) to 1,400 randomly selected cable-subscribing households in the downtown Reading area. This represents about 4% of the total of 35,000 subscribers to the cable company. Over the first three weeks in November, 406 questionnaires were returned and a follow-up phone survey was then conducted for a random sample of 50 of the non-respondents.

The purpose of the survey was to find out what proportion of the cable subscribing households contained one or more elderly persons. In order to insure that both elderly and non-elderly families would be equally likely to respond, a number of 'dummy' questions of general interest were included. The results of these surveys listed below do not include the answers to these 'dummy' questions. Appendix Table 1 presents the results comparing mail and phone responses; there was no statistical difference between the means.

Six months later in March 1977, a second mail survey was sent out to 1,400 households selected at random from the current list of cable subscribers to the cable company. Three hundred and fifty one responses were returned. A random sample of 482 of the 1,049 households who did not respond were called by phone, of which 344 resulted in completed interviews.

Appendix Table 1

Comparison of Mail and Phone Response to Survey of Cable Subscribers in November 1976

	Mail Survey	Phone Survey
Numbers responding	406	50
Age composition		
% households with at least one person 60+	49%	47%
% households with only 60+	31%	24%
% households with under 60 only	51%	53%
% households with both 60+ and under 60	18%	22%
% individuals 60+	28%	23%
Average numbers by age		
Average number 60+ per household with person 60+	1.6	1.5
Average number under 60 per household with persons under 60	2.9	3.1
Average number per household	2.7	3.1
Percent households which had watched BCTV		
% households who had watched BCTV	20%	26%
% households with 60+ only who had watched BCTV	30%	42%
% households with 60+ and under 60 who had watched BCTV	26%	36%
% households with only under 60 who had watched BCTV	11%	15%

No significant difference (at least 5% level of significance) between any of these means.

The purpose of the April survey was to ascertain:

1. the number of cable subscribing households which included a senior citizen who watched BCTV,
2. the frequency with which they watched it,
3. the remaining potential audience for BCTV (that is, of those elderly households that had never watched, how many had not done so because they were unaware of BCTV and how many might be interested in watching it when given information about it).

The results of the two April surveys are presented in Appendix Table 2. There were some significant differences between the two surveys on many questions.

Appendix Table 2

Comparison of Mail and Phone Response to Survey of Cable Subscribers in April 1977

	Mail Survey	Phone Survey
Numbers surveyed	351	344
Age composition		
% households with persons under 60 only	50%	60%*
% households with persons 60 or over only	31%	23%*
% households with both	16%	13%
% households no answer	3%	4%
Percent households where someone had watched BCTV		
% households with under 60 only	21%	13%*
% households 60+ only	68%	29%*
% households with 60+ and under 60	39%	33%
% age composition unknown	33%	17%*
% all households	39%	19%*
% households with anyone 60+	58%	30%*
Frequency of viewing where someone watched		
A. All households		
Once or twice only	25%	28%
More than once or twice, but not regularly	43%	30%*
Regularly once a week	7%	10%
Regularly 2-5 times a week	20%	31%*
No reply	5%	-
B. Households with anyone 60+		
Once or twice only	24%	26%
More than once or twice, but not regularly	41%	31%*
Regularly once a week	8%	5%
Regularly 2-5 times a week	22%	39%*
No reply	5%	-
Program preferences of viewers (percent who would be interested in watching)		
Citizen/government	75%	81%
Consumer education	73%	94%*
Help with tax form	49%	60%*
Health	75%	87%*

(Continued...)

Appendix Table 2
(Cont'd.)

	Mail Survey	Phone Survey
Program preferences of non-viewers (percent who would be interested in watching)		
Citizen/government	58%	72%*
Consumer education	62%	86%*
Help with tax form	45%	50%
Health	59%	79%*
Potential audience (percent of household who had never watched BCTV)		
% heard of BCTV	32%	49%*
% interested in watching	24%	30%

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* Means significantly different at 10% level of significance.

4. Estimates of Cable Subscribing Audience from Audience Surveys

The two surveys conducted in April 1977 (mail and phone) produced similar results as to the proportions of total households which had viewed BCTV and which fit into each of the four categories of viewing frequencies. However, the two surveys differed as to the total number of viewing households reported on each. We believe this occurred because of an underrepresentation of families with any elderly on the phone survey. Therefore, these estimates are based on a weighted average of the total reported number of viewing households on each survey (with each survey assigned a weight equal to its proportion of total number of elderly families in the two surveys).

$$V = \frac{v_m + v_p}{E_m + E_p}$$

where:

V = percent of total households with any elderly ever having watched BCTV

v_m = elderly households ever watching BCTV on mail survey

v_p = elderly households ever watching BCTV on phone survey

E_m = total families with any elderly on mail survey

E_p = total families with any elderly on phone survey.

The same weighted averages were applied to the viewing frequency categories. The results are that out of every 100 homes with any elderly subscribing to cable:

1) 45.6 had watched BCTV
2) 13.3 watched regularly 2-5 times per week

3) 3.1 watched regularly once a week

4) 16.6 watched more than once or twice but not regularly

5) 11.2 watched once or twice only

6) 1.4 did not report their viewing frequencies.

In order to arrive at an estimated audience figure, the following average expected viewing frequency per hour were assigned to the relevant group:

(total output = 7.5 hours of programming of BCTV per week)

1. Those who viewed 2-5 times per week regularly = $\frac{3.5}{7.5}$
2. Those who viewed once a week regularly = $\frac{1}{7.5}$
3. Those who viewed more than once or twice, but not regularly = $\frac{1}{30}$
4. Those who viewed once or twice only = $\frac{2}{177}$

where:

7.5 = hours of BCTV programming per week

177 = hours of BCTV programming during six months in which cable subscribers could watch.

Therefore, the expected mean number of home viewers per hour per 100 cable subscribing homes with any elderly is:

$$13.3\left(\frac{3.5}{7.5}\right) + 3.1\left(\frac{1}{7.5}\right) + 16.6\left(\frac{1}{30}\right) + 11.2\left(\frac{2}{177}\right) = 7.3$$

For the estimated 11,998 cable subscribing households in Reading with an elderly person, 876 would be the expected mean number of home viewers per hour.

5. Cost of Converters

The cost per hour of converters is determined by four factors: (1) the cost of installing converters; (2) the number of months over which the installation is prorated; (3) the monthly subscription rate for the converter; and (4) the hours of programming per month. The formula for estimating this cost can therefore be described as follows:

$$C_c = \left(\frac{C_{IN}}{R} + C_s \right) \div H$$

where:

C_c = cost per hour per converter

C_{IN} = cost of installing a converter

R = number of years for prorating installation costs

C_s = monthly subscription rate

H = hours of programming per month.

Estimates of the monthly cost per converter using different installation costs, number of years for prorating, and monthly subscriptions are presented in Appendix Table 3. Dividing these rates by 30 (the monthly hours of programming in Reading) yields the cost per hour per converter. Since the monthly subscription rate in Reading was $6.00, the upper and lower estimates of converter cost are 30 cents and 20 cents per hour respectively. (The lowest monthly cost is for a $5.00 installation charge prorated for five years and the highest a $35 installation prorated for one year.) Although the cable company in Reading charges $5.00 for installation, it is not clear whether this is what was actually paid for the installation of converters by the

Appendix Table 3

Estimated Converter Cost Per Month
by Installation Cost, Years Prorated, and
Monthly Subscription in Dollars

		INSTALLATION COST		
		$5	$20	$35
A. MONTHLY SUBSCRIPTION = $6				
Prorated:	1 Year	6.42	7.67	8.92
	3 Years	6.14	6.56	6.97
	5 Years	6.08	6.33	6.58
B. MONTHLY SUBSCRIPTION = $10				
Prorated:	1 Year	10.42	11.67	12.92
	3 Years	10.14	10.56	10.97
	5 Years	10.08	10.33	10.58

project, nor whether it is the appropriate economic cost. The cost of installation was part of a total fee negotiated with the cable company which is described in the report "Costs of Reading Interactive Cable System and Alternatives for Replication" (See Table 1.3 and text). No precise figure was given but $5 would appear to be rather low. In any case, it is clear that the major revenue source for the cable company is the monthly subscription and it is quite likely that $5 is well below the economic cost as an investment to gain the monthly subscription. Therefore, two higher estimates are also made and the calculations are based on a range of values.

APPENDIX C

Method of Deriving Estimates of the Number of Persons 60 and Over Eligible for Food Stamps and for Medicaid

Both the food stamps and Medicaid programs have exceedingly complex eligibility requirements which relate to income level, living circumstances, assets, and other factors. A lengthy interview at the County Board of Public Assistance is necessary to establish the actual eligibility of each applicant for these programs. As such, it was not possible to elicit all the necessary information on the two surveys done of the elderly in Reading to establish with certainty the eligibility of each individual in the sample. Nevertheless, detailed questions about living circumstances and income were asked and the answers to these produced reasonably accurate indicators of respondents' eligibility for these two programs.

1. Persons were deemed eligible for food stamps if they reported that:

   - they lived alone or with spouse only,* were not currently receiving food stamps, and had in the twelve months from September 1975 to September 1976 a total income which fell below the cutoff point for food stamps;

   - they were currently receiving Medicaid, Supplementary Security Income (SSI), or General Assistance (GA), all of which have income cutoffs equal to or below food stamps.

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* Respondents living with family other than spouse (a small proportion of total respondents) had to be excluded as the eligibility requirements for those people become a great deal more complex and required knowledge of the income of the other family members as well.

2. People were deemed eligible for Medicaid if they reported:

   - they were not currently receiving Medicaid, they lived alone or with spouse only, and had in the twelve months from September 1975 to September 1976 a total income which fell below the cutoff point for Medicaid;

   - they were currently receiving SSI or GA, both of which have income cutoffs at or below that for Medicaid.*

There is one problem which may bias the eligibility estimates. Not all respondents to the survey of the elderly were willing to answer the questions about income. This would bias the estimates if the proportion of real eligibles refusing to answer the income question varied systematically between income groups. Since the majority of respondents in each group did answer the income questions and since there was no way to force answers, it is probable that the bias is not serious.

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[*] Actually, anyone receiving SSI or GA is automatically enrolled in Medicaid; the point is that in Reading a number of such elderly do not realize they are enrolled and do not use their Medicaid benefits.